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THE WORK OF THE PUBLIC HEALTH SERVICE IN THE CARE OF DISABLED VETERANS OF THE WORLD WAR¹

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IN presenting even a brief paper upon the activities of the Public Health Service in its care of sick and disabled ex-service men and women, it is necessary, at least in some measure, to present certain legal aspects of the question. In no other way can one obtain any just and comprehensive view of the work which has been done in this connection and of the position of the Public Health Service in relation to this responsibility.

The legal authority under which this Service has performed these functions is found in an Act of Congress, approved March 3, 1919. This Act places upon the Public Health Service the responsibility for providing "immediate additional hospital and sanatorium facilities for the care and treatment of discharged sick and disabled soldiers, sailors and marines, army and navy nurses (male and female), patients of the War Risk Insurance Bureau."

The broad authority for supplying medical care and treatment to these patients resides by law in the War Risk Insurance Bureau and the Director of that Bureau is charged with providing "such reasonable governmental medical, surgical and hospital services" as he "may determine to be useful and reasonably necessary." It will be seen, therefore, that the Public Health Service, by law, becomes, in effect, an agency through which the Director of the War Risk Insurance Bureau may secure the necessary medical care and treatment for his patients.

It is to be noted in this whole matter that the purpose of Congress in the passage of legislation for the general care of disabled veterans of the World War contemplated something very different from the pension systems which have hitherto obtained in the care of similar persons of other wars in which the United States has been engaged.

¹ Read at twenty-ninth annual meeting of the Association of Military Surgeons of the U. S., Boston, Mass., June 2-4, 1921.

Congress had in mind a broad constructive program whereby a man discharged from the military forces of the United States, disabled, would, in effect, receive compensation for his disabilities, medical care and treatment to the point where he had received maximum benefit therefrom, and finally, in the case of residual disability, the necessary vocational reeducation to fit him for some gainful occupation whereby he might be enabled to earn as good a living as he did before.

It, of course, follows that the compensation paid was to be regulated in accordance with the degree of residual disability and the readjustment to civil life and ability again to follow a gainful occupation.

The plan, therefore, of caring for these disabled veterans included three major phases, namely, the rating of disability and the payment of compensation; medical care and treatment; and vocational reeducation, when necessary.

Under the law the rating of disabilities and the payments of compensation were to be performed by the War Risk Insurance Bureau, the furnishing of vocational reeducation by the Federal Board for Vocational Education. The Director of the War Risk Insurance Bureau was left responsible for the medical care and treatment, but by law he could make use of the facilities of the Public Health Service for the discharge of this important function, and it seems to have been the intention of Congress that he should make use of this Service, for a time at least, in discharging this particular responsibility.

The Public Health Service, therefore, at the request of the War Risk Insurance Bureau, assumed, in reality, the responsibility of rendering the necessary medical care and treatment to the beneficiaries of that Bureau and, for a time, of supplying also the necessary personnel for the performance of certain intrinsic medical functions of the War Risk Insurance Bureau in the rating of disabilities. It also supplied to the Federal Board for Vocational Education similar personnel for the intrinsic medical functions of that Bureau, as well as rendering medical aid in the care and treatment of trainees of that Board, acting in this capacity as its chief medical agency.

It will be noted in all of this that the Public Health Service was acting at the request of the two Bureaus involved to supply, in what was a real emergency, the medical functions necessary in the performance of this work. Also, it will be noted that this large responsibility was placed very suddenly upon the Public Health Service. It had been made manifest during hearings in Congress that there was decided objection to the designation of either the Army or the Navy as the medical agency to supply medical care and treatment for disabled ex service men and women. The Public Health Service, being a civil

medical organization under the Government, was very naturally selected as the temporary agency to discharge this responsibility.

Under such conditions the Public Health Service found itself quite suddenly charged with a large and important responsibility and, immediately upon the passage of the Act quoted, proceeded to organize on a commensurate scale to meet a problem the character of which was practically unknown and the magnitude of which could only be surmised.

This increased responsibility of the Public Health Service meant an immediate expansion of its central organization in Washington, the acquirement of additional hospital facilities throughout the United States, and the creation of an administrative field organization through which it might decentralize its activities and come into contact with disabled ex-service men and women everywhere. This latter organization was known as the organization of District Supervisors and will be referred to later.

The size and character of the problem faced by the Public Health Service was, of course, a matter of great urgency and every effort was made to determine definitely the medical needs of disabled ex-service men, so far as concerned medical facilities and personnel.

In conjunction with the War Risk Insurance Bureau there was compiled, and finally published, Public Document No. 481 of the 66th Congress (December 5, 1919). In this Document this entire problem was analyzed and certain very definite conclusions were stated as to the need of medical and hospital facilities for the proper care and treatment of discharged disabled veterans.

It is unnecessary at this time to attempt here any analysis of this Document, but it is worthy of some comment. It indicated that within two years from its date of publication there would be needed for the patients of the War Risk Insurance Bureau the following hospital beds:

General medical and surgical.....	7,200
Tuberculosis.....	12,400
Neuro-psychiatric.....	11,060
Total.....	30,660

Making due allowances for the suitable beds then available, it was estimated that there would be required for necessary construction and equipment a total appropriation of \$85,000,000 and the draft of a bill was offered which would appropriate this sum of money for this purpose. The bill contemplated, however, that this money should be expended in annual installments extending over a period ending June 30, 1923. This document also indicated that the "peak of the load," at least for

neuro-psychiatric and tuberculous disorders, would not be reached for some years.

The Public Health Service was subjected to a great deal of criticism for the presentation of what was then regarded as a pretentious program. Moreover, it was rather generally felt that the facilities which had been provided during the war for the medical care and treatment of soldiers and sailors could be very readily and very satisfactorily made use of in the care of disabled, discharged soldiers and sailors at the termination of the war.

It was not clearly appreciated that the war program for the care of sick and disabled could by no means be converted into an adequate and satisfactory system for the care of sick and disabled persons under peace conditions. At all events no money was appropriated for purposes of constructing hospital facilities.

It is highly significant, however, at the present time to note that the magnitude of this problem, as foreshadowed in the Public Document quoted above, has, since the date of its publication, been more or less verified by subsequent experience.

Making due allowances for discrepancies, which might have been expected, and for developments, which could not readily have been anticipated, it may be truthfully said that this document very clearly indicated more or less accurately the hospital needs in the care of sick and disabled ex-service men and women, if these patients were to receive the character of medical service which, in the judgment of the best medical minds, was necessary for their restoration to health and which could not be satisfactorily given in other than suitably constructed institutions.

Leaving aside these considerations, it was apparent that plans were immediately necessary to meet the urgent demands suddenly created by the termination of the war and the discharge of sick and disabled soldiers and sailors. The Public Health Service, in addition to the plans for the future which have been mentioned above, felt it necessary at once to secure temporary facilities of the best nature possible, with the idea that the necessary appropriations would be forthcoming for the construction of good ultimate facilities.

Under the law of March 3, 1919, certain limited funds were provided for construction purposes and the purchase of existing plants, and the Public Health Service was given certain temporary hospitals which had been made use of during the war. It was also authorized to take over leases which had been made by the Army for war purposes, and was further granted authority itself to lease any suitable institutions and convert the same to hospital purposes. Moreover, provision was

made for transfer from the War and other Departments of such facilities as could be released from time to time. Authority also existed for making contracts at a per diem rate with existing civilian hospitals for the care of disabled ex-service men and women.

By these arrangements it was possible, rather rapidly, to increase the number of available beds, although the character of the beds used left a good deal to be desired. It was understood of necessity that this whole arrangement was of a temporary character to meet emergency conditions, pending the development of governmental institutions for the better housing and the better care and treatment of these patients.

By such methods the Public Health Service, up to the present time, has been able to secure the control of a considerable number of places and is, at the present time, operating some 60 odd hospitals with a total bed capacity of 18,500, and under arrangements now existing expects to increase this number within the next six months by over 3000 additional beds. Needless to say many of the places now operated are by no means satisfactory, but in the emergency they have served a useful purpose and doubtless will continue to be used until recent appropriations by Congress are utilized in building better accommodations.

By the passage of an Act approved March 4, 1921, appropriating \$18,600,000 for the purpose of constructing hospitals or extending existing plants for the care of disabled ex-service men and women, Congress has apparently signified its intention of entering upon a construction program which, it is believed, will ultimately furnish for these patients institutions of a suitable character and so located as to serve the needs of the situation.

The sum of money appropriated in this measure is inadequate for the need and, if the indications are to be met, must be supplemented by additional funds. The mere existence of a large number of hospital beds means nothing whatever. It is, of course, apparent that the character of beds and their geographic location are matters of prime importance. Manifestly hospital beds of a temporary character, suited to emergency needs, cannot be satisfactorily used for the care of neuro-psychiatric and tuberculous patients, and these two classes of patients are the ones for which there is most urgent need at the present time. Undoubtedly the need for these two classes of patients will continue for a long period of time.

The use of temporary beds of an unsatisfactory character, as well as the extensive use of contract hospitals, has subjected the Government to a great deal of harsh criticism. Such criticism cannot be avoided unless there exist satisfactory governmental facilities for the care of these men who rightly have such a large place in the heart of the American people.

In a brief statement of this kind one can do little more than give a general outline of what has been done. A summary will give some idea of the volume of work which has been performed during the past two years and the progress which has been made.

In March 1919, shortly after this work was assumed by the Public Health Service, there were under treatment only about 1500 in-patients. Two years later, in March, 1921, there were reported nearly 26,000 such patients in the hospitals of the Public Health Service, and in civilian hospitals under contract with this Service, making an increase of over 1,600 per cent in two years. In other words, within a period of two years this Service had to provide over 24,000 additional beds. The significance of these figures, however, is still more amplified by the fact that in 1919, before the inception of the War Risk Insurance work, the majority of the patients hospitalized by this Service were general medical and surgical cases, while in March, 1921, about two-thirds of the patients were suffering from tuberculosis and mental and nervous diseases. By May, 1921, there were reported in hospitals under the care of the Service about 9,000 tuberculous and about 7,000 neuro-psychiatric patients. These figures include not only War Risk patients, but all beneficiaries of the Public Health Service.

The hospitalization problem has been very acute, as the Service has had considerable difficulty in securing sufficient beds for the rapidly increasing number of patients. In March, 1921, on an average 2,000 beneficiaries of the War Risk Insurance Bureau were admitted each week to Service and contract hospitals. Weekly discharges amounted to about 1,700, thus leaving a steady net increase of about 300 patients per week. Formerly a majority of the patients had to be treated in contract hospitals. On March 31, 1921, there were more patients in hospitals operated by the Service than in civilian institutions, and it is expected that in the near future most of the ex-service men and women will be given the benefit of care and treatment in governmental institutions.

The small system of out-patient departments has been gradually expanding and is continuing to expand. It is anticipated that eventually there will be a splendid out-patient department service at all important points of the United States.

In March, 1921, the U. S. Public Health Service had 58 dispensaries in operation throughout the country, exclusive of those conducted within Marine and Public Health Service hospitals. Nine of these dispensaries located in the leading cities of the country are completely equipped and staffed for all forms of out-patient diagnosis and treatment. They contain fully equipped clinics in all the various specialties of medicine

and surgery; also clinical laboratories, x-ray plants, and pharmacies. The other dispensaries, located in cities averaging 100,000 to 500,000 population, are not so fully equipped as the former, but consist of one or more special clinics, and render satisfactory service. In addition to the regular dispensaries, there are officers of the Public Health Service distributed throughout the country who are authorized to give treatment to ex-service men and women.

The organization of the fourteen district supervisors' offices was created, and these offices with their sub-agencies covering the entire United States, reach practically into every county, so that prompt contact may be made with ex-service men and women everywhere. This organization has rendered inestimable service in reaching ex-service men and women, and giving them prompt care and attention. These offices were begun in a small and tentative manner, each with less than 2,000 feet of floor space, one doctor and a small force, a little over a year ago. In March, 1921, most of these offices occupied from 25,000 to 40,000 feet of floor space, with a large medical and clerical personnel in the headquarters, and well organized sub-agencies throughout the districts.

In carrying out its work for ex-service men and women the Service has assembled a large personnel. The medical personnel numbers about 2,700 medical officers, exclusive of designated examiners on a fee basis. A dental corps has been created and numbers about 190 dental officers; a corps of female nurses has been created and numbers about 1,500; a reconstruction service has been formed and numbers about 500 reconstruction aides; a dietetic service has been organized and numbers about 150 trained dietitians.

Since the inception of this work, there have been cared for in hospitals by this Service about 150,000 patients of the War Risk Insurance Bureau, who were furnished a total of about 9,000,000 hospital relief days. Also, about 1,200,000 out-patient treatments have been furnished, and a total of nearly 1,000,000 medical examinations have been made. Special services of various kinds have been arranged. For example, about 70,000 patients have been given dental treatment. By May, 1921, over 4,700 patients were being given occupational therapy and over 4,500 physio-therapy each week. Prosthetic appliances of various kinds have been furnished to thousands of patients.

An inspection service has been formed for general supervision, and a number of officers are kept constantly in the field investigating complaints and making reports. This inspection service covers not only the hospitals of the Public Health Service, but also civilian institutions under contract. It is of interest to note that of the hundreds of com-

plants made, less than twenty-five per cent of them were found to have any real basis in fact.

In cooperation with the American Red Cross, there has been organized an extensive and efficient medical social service, ministering to the needs of the discharged soldier and sailor in many different ways. The activities of the American Red Cross have been supplemented by many other agencies, including the American Legion, Knights of Columbus, Jewish Welfare Society and others. All of them have rendered fine assistance in the prosecution of this important phase of the work.

Reference should be made to recent events with regard to the transfer to the War Risk Insurance Bureau of certain functions which have been up to this date discharged by the Public Health Service. As explained, the responsibility of the Public Health Service in a good deal of this work has been of an emergency nature. The administrative arrangements created, under the law, by the three major agencies involved in this work (War Risk Insurance Bureau, Federal Board for Vocational Education and Public Health Service) have been the subject of a great deal of unfavorable comment by reason of the alleged lack of cooperation between the agencies involved. It is needless to deny that the administrative organization, so formed, left much to be desired, but it can be defended on the ground that under the law no administrative organization of a better character could readily have been formed, and much of the criticism which has been leveled at this organization has, I feel, been rather of a political nature than otherwise. However that may be, the organization certainly could have been better in a great many ways.

The entire subject has received a great deal of attention and has been a question for earnest thought and deliberation upon the part of the official agencies concerned.

As a result of all of these activities the President finally called together a commission to consider the entire matter, and upon the recommendations of this commission certain very radical changes have been made in the matter of administering this work. Such changes are likely to go even further, as soon as there is legal authority, in order to complete the desired program.

The report of the President's commission contemplated the creation by law of a new bureau in some existing department of the National Government. Various names have been suggested for this new bureau. The Director of this new bureau was to be charged with the responsibility of discharging all the functions pertaining to the care of disabled ex-service men and women, including medical functions as well as functions pertaining to vocational rehabilitation, and payments of compensation.

Bills are now pending in Congress which would put into effect the recommendations of this commission and thus consolidate under one Director all of the activities pertaining to disabled veterans. In the discharge of these functions, however, both the recommendations of the commission and the bills pending in Congress contemplate the use by this new bureau of contract facilities with civilian hospitals, official hospital facilities as operated by the Public Health Service, the Army, the Navy, the National Homes for Disabled Volunteer Soldiers and the Interior Department (St. Elizabeth's Hospital).

It will be noted in this program that there occurs a consolidation of all functions pertaining to the care of disabled discharged veterans except the maintenance and operation of hospitals and dispensaries; and there is made available for the use of the Director of this new bureau all of the official hospitalization agencies of the Government. This will mean, of course, a development of the Government's hospital facilities by all of the official agencies involved and undoubtedly there will be in this connection important developments, especially in the National Homes for Disabled Volunteer Soldiers.

This would seem entirely logical because this official agency ultimately will be charged with the care of a great many of these patients. It will also be noted that there is placed in the hands of this new Director the function of making medical examinations by which disability ratings are made, and in the discharge of this function he necessarily assumes charge of the organization of District Supervisors which was created and formerly operated by the Public Health Service.

By the direction of the President the Secretary of the Treasury, as soon as the President's commission had made its report, proceeded at once to put into execution as much of this report as was possible under existing law. The War Risk Insurance Bureau and the Public Health Service, both being bureaus of the Treasury Department, permitted the Secretary to put into effect the ideas of this commission so far as it involved these two bureaus.

This having been done the Public Health Service has already assumed the position of a hospitalization agency furnishing medical care and treatment at the request of the Director of the War Risk Insurance Bureau. Undoubtedly the Public Health Service will continue to discharge this function in connection with this work for some years.

In concluding this rather sketchy outline of the work which has been done, it seems necessary to refer, however briefly, to the criticisms made against the Public Health Service and other official agencies involved. In general, these criticisms have alleged lack of coordination

among these official agencies and mismanagement of hospitals with improper care and treatment of the beneficiaries housed therein.

Criticisms with regard to the hospitals will undoubtedly continue in a greater or less degree. Such a thing is inherent in a situation of this kind and much of it cannot well be avoided. Speaking for the Public Health Service, I know that we have sincerely attempted to render to ex-service men and women the best service possible under the circumstances. I realize that we may have fallen short of our ideals in a great many respects, yet I feel under the circumstances that disabled veterans who have come under the care of the Public Health Service have received sympathetic consideration as well as good professional care and treatment.

While the Public Health Service was organized and is maintained by the National Government as the federal health agency charged with the responsibility of the conservation of the health of the nation, it has also assumed, under law, the additional responsibility of furnishing to veterans of the world war medical care and treatment. This added responsibility has been accepted with a full comprehension of the privilege conferred and a firm desire to meet it as adequately as circumstances and conditions permit.



AFTER CARE AND MEDICAL FOLLOW-UP OF WAR RISK INSURANCE BENEFICIARIES¹

By J. G. TOWNSEND

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IN presenting this paper, I wish to emphasize a field in the care of the ex-service personnel of the late war which has occupied a prominent place in public opinion and in the minds of those engaged in rehabilitation, but which must have a practical application in order to be of real service. I refer to the after care and medical follow-up of the ex-service man as a feature of Government physical rehabilitation.

We are all familiar with those times, following the passage of the War Risk Act, when we were confronted with that gigantic task of furnishing medical aid and treatment to the thousands of ex-service beneficiaries who had been handicapped through service to their country, and in the fulfilling of a Government obligation, by returning our disabled veterans to their communities as nearly as possible in the condition in which they had been found, or at least to compensate them for what the Government could not replace in physical blessings. At that time the responsibility for such medical care became an additional duty of the U. S. Public Health Service, and to more easily accomplish maximum results with a minimum of delay the work was subdivided into fourteen Districts, each District consisting of several contiguous States and having the same geographical boundaries as enjoyed by the Federal Board for Vocational Education.

It was my privilege to have supervision of the physical rehabilitation work in the Fourth District, which embraces the States of Maryland, Virginia, and West Virginia and the District of Columbia, and in the discussion of aftercare I can only speak of what has been done and what is now being done in that area known as the Fourth District, in hopes that similar activities might be intensified elsewhere.

In the beginning of the work the problem was examinations and treatment, but as time went on the necessity for bringing into play the "humanizing agency" and carrying into the homes that spirit of friendly Governmental neighborliness by home visits became more and more apparent.

Case after case has been brought to the attention of every District Supervisor of patients who, being sent to hospitals, possibly for the first time, experienced homesickness, failure to adjust personality to

¹Read at the 29th Annual Meeting of the Association of Military Surgeons of the United States, Boston, Mass., June 2-4, 1921.

environment, difficulties in compensation adjustment, and worries over family and domestic conditions, with the result that these individuals deserted from the hospital, or left against advice and returned to their homes, where proper care and treatment could not be given, and where oftentimes the immediate family was subjected to the danger of infection.

Aside from the importance of doing all possible to help these claimants as individuals, many of whom comprised the great, ignorant, illiterate class, by sending workers and field investigators to the very home, and attempting to accomplish a readjustment of things, it must be realized that there is a big public health problem involved. Especially is this true of active tuberculosis and nervous and mental disorders. The psychology of the tuberculous individual is peculiar; he becomes easily dissatisfied, and, without warning, leaves the institution where everything is being done for his benefit, only to return home to a family unable to care for him, or he becomes a wanderer from place to place in search of the cure which is his if his cooperation is obtained. The same is true of the neurasthenic or hysterical type of individual, or even of the more serious type of mental diseases such as dementia praecox and manic depressive insanity.

It cannot be too strongly emphasized that patients of this type entitled to hospitalization and needing such care, but who have either deserted the hospital, or refused absolutely to go, create in local communities additional foci which in proportion enhance the gravity of the tuberculosis problem and the problem of mental hygiene. It is, therefore, not only our problem as Government officers, but it is a problem which confronts the State Boards of Health, various county Boards of Health, city Boards of Health and the family unit itself.

It is possible, in this connection, for District Supervisors to furnish local Health Officers with data as to the prevalence of tuberculosis and mental diseases, which greatly augments the value of the endemic index of the community in question.

Realizing all of these things in the summer of 1920, and feeling that District Supervisors had a logical right, from the standpoint of the public health of the community involved, to request assistance from the local Boards of Health and allied agencies in visiting such cases, letters were written to the State Health Officers and County and City Health Officers, with the request that insofar as it was possible, existing machinery be utilized to the fullest extent in assisting us in the medical follow-up and nursing visits to the home of the ex-soldier.

The response to this appeal was gratifying in the extreme, practically all agencies communicated with promising hearty support in the pro-

gram. It was found that there were approximately three hundred nurses, representing the Red Cross, County, State, Tuberculosis and Industrial nurses, who might be utilized in this follow-up work in the District. If a nurse was not available, contact was made with workers who had no medical training, but who could at least submit common-sense reports as to what was needed.

The next step was to organize a Welfare Section in the office of the District Supervisor with a chief nurse in general charge of the work and additional nurses in the District of Columbia, Maryland, Virginia, and West Virginia, acting as coordinating agencies for their respective States and working in close liaison and cooperation with the chief nurse of the State and the Health Officer, but under the immediate direction of the District Supervisor.

The method of procedure, in brief, is as follows: A patient leaves the hospital against advice, deserts, or refuses to accept hospitalization, returns to or remains at home to his own detriment, and oftentimes to the detriment of the local community from a public health point of view. The fact is reported to the District Supervisor by the Hospital, by the patient who refuses hospitalization, by the Red Cross, American Legion, Veterans of Foreign Wars, and like agencies. The Chief Nurse of the District is advised, who in turn communicates with the Government welfare nurse in the State, representing the District Supervisor, who in turn makes contact with the State nurse in communication with the nearest local nurse or Social Service worker in that community for investigation of the case. In addition to her duties as liaison nurse, the Government nurse visits cases in her own community upon advice received from the central office or from the local Supervisor.

It very often happens that the initial visit reveals the fact that delayed compensation or failure to adjust the same causes fear in the mind of the claimant that his family will not be provided for in case he should leave home. The ascertaining of this fact and prompt adjustment of the attending difficulty is the important factor which is immediately considered, with the result, oftentimes, that claimants return or proceed to the hospital in a contented frame of mind.

If the patient happens to be suffering with active tuberculosis, he is furnished with a sanitary packet, consisting of 2 large paper spittoons for emergency use, 25 hand paper cups, 1 metal container and 125 paper napkins, with instructions regarding the use of these in the prevention of the spread of tubercle bacilli. Over 1,000 of these outfits have been distributed since the beginning of the work. Official literature published by the U. S. Public Health Service for the care and prevention of tuberculosis is distributed with discretion among tuberculous

patients and their families, and when the nurse deems it advisable the members of the family are urged to report to the State Department of Health for a confidential lung examination provided by those Departments for people exposed to this disease.

It should be realized that very often results cannot be obtained until after a number of visits, sometimes as many as ten or twelve being made, but a rapid adjustment of compensation and a continuous, sympathetic, personal contact with the claimant is a most important factor in enlisting his confidence and prevailing upon him to submit to hospitalization when indicated.

A complete report, which has been standardized, is submitted to the District Supervisor's office upon every initial interview. In conjunction with reports made on subsequent visits, a calendar file is maintained for revisits, by use of which the case comes out of file at stated intervals of a month or two months, with the date and diagnosis of the last examination of the claimant, thereby enabling the nurse to more intelligently instruct and administer to her claimant's individual needs.

Claimants with positive diagnoses of tuberculosis or neuro-psychiatric disorders, undergoing treatment in their homes, are visited monthly; if bedridden they are referred to the Visiting Nurse Association for nursing care. All other cases are visited at intervals of sixty and ninety days, according to the condition of the claimant, at the discretion of the nurse.

In these, and in innumerable other ways, the nurse fits herself into the big machine, lending to it the element of human interest which finds a ready response in the claimant and draws forth from him a warm appreciation of what the Government is trying to do for him in a truly personal way. At the same time, in proportion to local interest, health protection is afforded the community.

A summary of work accomplished by Government nurses and nurses of cooperative agencies in the Fourth District, for the period from December 1, 1920, to May 1, 1921, follows:

Number of visits made by U. S. P. H. S. nurses	2,332
Number of patients actually interviewed by P. H. S. nurses	1,351
Number of visits made by nurses of other agencies	204
Number of patients actually interviewed by nurses of other agencies	148
Number of follow-up blanks submitted by nurses.....	573
Number of cases being carried	2,066
Office interviews (District Supervisor's office).....	310

An analysis of 500 cases visited in the homes by the nurse shows the following results:

<i>Class</i>		
	Tuberculosis:	
	active	129
	inactive	177
	Neuro-psychiatric	92
	Medical	72
	Surgical	30
<i>Sex</i>		
	Male	190
	Female	10
<i>Race</i>		
	White	399
	Black	101
<i>Nationality</i>		
	American	493
	English	2
	Italian	2
	Greek	1
	Russian	1
	Spanish	1
<i>Social Status</i>		
	Single	282
	Married, having no children	110
	Married, having children	108

In practically all of the series of cases visited, the general attitude of the family was friendly, and they were appreciative of the home visit and personal contact.

In 304 homes, the sanitary condition and social attitude of the family were conducive to improvement of the claimant's physical and mental condition; in the remaining 196 homes, representing 39.2 per cent, the sanitation was poor and absolute ignorance prevailed regarding the simplest rules of hygiene and public health.

Of the 500 cases, hospitalization was recommended in 218; of this number, 103 were hospitalized through the efforts of the nurse. The other 115, who refused hospitalization, show the necessity of close supervision and education as to the advantages of institutional care. Contact at stated intervals is maintained with the remaining 282 cases in which home treatment is indicated.

Federal Board training was granted to 27 cases, subsequent to the visit of the nurse. The nurse has been of special help to the claimant in assisting him to select a course of training consistent with his ability and preliminary education. Thirty-three were found to be taking this training on the initial visit of the nurse.

In this series, twenty of these claimants have died, all with a diagnosis of tuberculosis.

In order to more intimately bring this work to your attention, and in a small degree demonstrate the need for this line of action, I will cite briefly a few cases which are representative, especially in the rural districts among the ignorant and illiterate class:

Case I

B. D., a colored claimant living in Virginia, twenty-three years old, served in a labor battalion overseas and returned home mentally unbalanced. On account of his queer actions, his mother sought the help of the War Camp Community Service, who referred her to the representative of the Public Health Service in her town. Immediately an examination was made by the U. S. Public Health Service physician and hospital treatment recommended, which, however, was not accomplished at that time due to the ignorance and prejudice of the family. Repeated offers of hospitalization to this man were refused, during which time his condition grew worse. The U. S. Public Health Service physician then referred the case to the Government welfare nurse in Virginia, who made a trip of eighty miles to interview and overcome the opposition of the family.

On her initial visit, the nurse found the man in the most squalid surroundings. The family consisted of a step-father, mother, and four children living in a dilapidated frame house, in an environment most unsanitary. There was no heat in the house, though it was quite a chilly day, and the children were eating raw potatoes, which evidenced the lack of food. In order to obtain light and air, nails had to be removed from the windows, before they could be opened.

From the general appearance of the patient, a diagnosis of catatonic dementia praecox was assumed. The facial expression was apathetic, and the patient would not respond to questions or stimulation. At times, painful stimulation would evoke rambling, incoherent phrases. Ordinary questioning would bring no response.

Hygienic instructions were given to the mother, and the patient made comfortable. The individual interest shown this patient by the Government, and the earnest desire to have him properly taken care of by the Government had the desired effect and broke through the barriers of prejudicial opposition, with the result that hospitalization was immediately perfected in one of the hospitals of the Service.

The children were referred to the Children's Clinic for treatment, as they were suffering from malnutrition.

Case II

R. D. had served twenty-eight years in the Army and was discharged with a Surgeon's Certificate of Disability, with a diagnosis of active tuberculosis. He had been hospitalized under the U. S. Public Health Service, but had left against medical advice and returned to his old home in Maryland.

Through the automatic reference to the District Supervisor of all cases leaving hospitals, this case was reported to the welfare nurse in Baltimore, who investigated existing conditions.

The patient was found in an ill-kept lodging house, with halls and floors filthy and littered with decaying vegetables. The ventilation and light were poor. The condition of the house, together with the general appearance of the man, evidenced the need of nursing visits and the importance of hospital care. A sputum outfit, and hygienic instructions were given him, emphasizing the use and proper disposal

of the sputum cups and protection of other roomers against contracting his disease, but hospitalization was emphatically refused by the claimant.

On the next visit of the nurse, the claimant had recently moved to another lodging house, where it was learned he had had several hemorrhages. Upon this second visit, the claimant was found to be much worse. The advantages of hospital care and the importance of his removal from the community to which he was a menace, were again impressed upon him. He finally agreed to accept hospital care, and reported to the Baltimore office, where his hospitalization was authorized by the U. S. Public Health Service.

This claimant has improved steadily since the importance of proper care (through his cooperation) was impressed upon him, and the boarding house where he was domiciled freed from an active infection which endangered the health of the remaining tenants.

Case III.

W. B. is an intelligent white man twenty-two years old, with active tuberculosis incurred in line of duty, living on a farm in West Virginia, with a wife and two children. He was referred to the Supervisor's office by the American Red Cross, was examined and hospitalized, but remained in the hospital only a short time, leaving on account of homesickness.

The local office was notified of his departure from the hospital, and the nurse sent to investigate home conditions and to give instruction in the simple rules of health and hygiene.

The home was found to be small, consisting of four rooms, but fairly clean and typical of the small farm home in that part of the country. The claimant had a separate room where he enjoyed plenty of fresh air and rest. He was given instruction as to the proper care of himself and the use and disposal of the sputum outfit left with him. The wife was instructed as to the importance of keeping her husband's dishes separate, and how tuberculosis was contracted and how prevented. Special precautions were given regarding the children. The wife was found to be an intelligent woman and anxious to cooperate with the nurse for the benefit of her husband and the protection of her children.

The matter of adjusting his compensation was taken up with the Bureau of War Risk representative and an early adjudication made.

This claimant is visited monthly for hygienic instruction and health supervision. He is improving satisfactorily, and it is hoped that eventually his antipathy to hospitalization will be overcome.

This case is cited as demonstrating what can be done by home care in restoration to health of a claimant, by local cooperation, until such time as hospitalization is accomplished, and the opportunity of sowing the seeds of preventive medicine which may bear fruit in the generations of tomorrow.

The appreciation of this individual interest is brought to our attention from time to time in letters received by the nurses from claimants and parents. I will quote:

My dear Miss M—:

I am writing you a few lines to let you know I got home all O. K. and feeling better. Believe me Miss M— I won't forget you until I die—you have been so good to me I wish you could get me transferred to some dentist up here—I will appreciate it very

much. I told my wife and my grandmother what you did for me and they said they would like to see you.

My family send you best regards.

Yours as ever a claimant.

My dear Miss:

I received your letter this morning. I thank you very much for the interest you have taken. I was to see my son on the 22d, Washington's Birthday and saw the doctor also. They have my son now in Ward 35, giving him the T. B. test. The doctor said they would send his report in about ten days.

Thanking you again for all your pains in advance.

Yours very truly,

This intensive utilization of existing health agencies and the welfare nurse is not new in idea, but seems to be comparatively new in application. The Canadian Government has recognized the value of this procedure both to the individual and to the public, and in the report of The Department of Soldiers' Civil Reestablishment in Canada, published in December, 1920, this phase of the work has been given a prominent place, and is so characteristic of our attempts here that I will quote from this report as follows:

In the reconstructive work of rehabilitation of the disabled soldier, the Social Service nurse has become an essential and indispensable part of a program which has for its aim the restoration, preservation, and promotion of health among those ex-soldiers who come under the care of this department.

This is a specialized nursing activity, and the Social Service nurse is to be regarded not merely as an attendant upon the sick, but rather as an educator and reformer. She must possess, in addition to the educational and technical qualifications incidental to her professional calling, a special experience and training in the fundamental sciences of psychology, sociology, hygiene, sanitation, and nutrition.

Participation in or duplication of the work for which the different Public Health organizations are responsible is avoided by mutual cooperative arrangements with Public Health officials. All Social Service work is under the direction of the Unit Medical Director or other physicians, and is carried out only in accordance with his expressed instructions.

Following discharge from sanatorium, each individual case is visited at his home within one month of his discharge, and at varying intervals subsequently, according as the circumstances of the case demand. The Social Service nurse, in visiting the home of a tuberculous case, observes existing conditions in the environment, and, when indicated, instructs and demonstrates to the patient and members of the household the precautions which must be taken to avoid spread of the disease. She brings to the aid of the patient such measures of relief as are required, and helps to regulate those factors in the daily life of the household which have a direct relation to health—cleanliness, diet, clothing, fresh air, sleep, and recreation. . . .

The Social Service nurse helps the patient and household to meet the difficulties involved in the period of readjustment from hospital to home, adding thereby to the peace of mind which is so essential to prompt recovery. She assists the patient in carrying out the physician's instructions, helps to eliminate or readjust contributory

factors in the environment, teaches the principles of mental hygiene, and generally exercises supervision until the need therefor is no longer present.

In recognition of the value which of necessity accrues from this phase of physical rehabilitation, is it too much to anticipate that all local boards of health and allied agencies will put their shoulders to the wheel in an effort to put this feature of our work "over the top" with the ultimate end in view of giving to the claimant the best that the Nation affords, as well as protecting their own community in matters of public health, the problems of which have been so greatly augmented by the Great War. *It can be done*, if the local community will realize that the Government's problem is the local problem, and that the maximum benefit can result only by an amalgamation of effort, both Governmental and Civil.



LESIONS OF THE KNEE IN EX-SOLDIERS¹

By MCGOW FREDERIC J. COTTON

Medical Corps, U. S. Army

(With two illustrations)

IN the last eighteen months there have been admitted to the Parker Hill Hospital an unusually interesting group of cases of knee joint lesions, of which 15 in all have come to the operating room.

This rather large number of cases for a general hospital seems to be the result largely of injuries received in France or the training camps—not battle casualties—in which the less obvious nature of the disability caused disregard of the case by doctor and patient alike.

Now, nearly three years later, a lot of the men have grown tired of getting along with the half crippling disability, and have for the first time come in search of relief, and with their minds made up.

These were in part cases of torn and displaced semilunar cartilages, but there were four cases of definite osteochondritis dissecans which proved of no little interest. Two cases had only adhesions following contracture—both from gun-shot wounds, both stretched under ether, neither of particular interest save that intervention produced results according to a method perhaps not followed as consistently as it should be.

This method rests on the fact that, while "brisement force," the rough breaking-up of adhesions, whether within or near a joint, fails of its object in the end from the excessive reaction and the unavoidable aftertime of soreness that gives fresh stiffening, yet, if in the course of physiotherapy and gentle stretching exercises we come to a stop, then we may, by gentle stretching under an anaesthetic, carry the range of motion just beyond this dead center without entailing much soreness afterward. Some adhesions may give way but what we do in the main is to stretch taut tissues. A few days of soreness mitigated by cautious massage, bring us back to the routine of limbering the joint gradually through a further arc.

"Brisement force" is out of date, this maneuver is not.

Case 3 was a tubercular knee, primarily synovial I think, a bit neglected, slow in progress, but with an extraordinary amount of diseased tissue. An excision, with careful dissection of every bit of diseased soft parts, gave primary union, and now a useful knee according to his last report of May 27, 1921.

This case was put up straight, for I am as yet only uncertainly a convert to the more modern style of excision shaped to get a flexed knee, particularly in the tubercular cases with their less certain pros-

¹Read before Association of Military Surgeons, Boston, Mass., June 3, 1921

pect of bony union, and particularly in patients who have to be much on their feet. In these I think the straight leg is more secure and comfortable. In this case fixation with bone pegs was used. All support, plates, wires, and pegs, I am coming to think of doubtful wisdom. In this case the pegs were useful and gave no trouble, but all these ornaments have a way of getting discontended, and worrying their way out, and one can do very well without them.

Case 4 was a supracondylar osteotomy for massive scar contraction about the knee, due to a crushing injury. I should have done better to have done an excision, despite the risk of sepsis from working in the broad scar masses, for the irritation of the small range of motion present has proved, in spite of the bettered angle, a cause of persistent disability.

Case 5 is of a good deal of interest. D.S. as a result of a football injury at Camp Devens early in 1918 had had an intermittently disabled knee that was in its best intervals uncertain—slipped and caught a good deal, and in flexion under weight developed an appalling crunching noise loudly heard a half dozen feet away—a very disturbing factor. There was recurrent moderate synovitis.

The knee was strapped and massaged and watched for months. It was evident the crucials were gone, and there was a free slipping forward of the condyle at the inner side forward on the tibia, considerable anteroposterior mobility, and a little lateral play.

Admitted June 19, 1920.

June 29, 1920. Ether and operation: Cotton. Incision was made over the internal condyle of left femur extending down over internal tuberosity of tibia. Knee joint opened and crucial ligaments found to be torn. Semilunar cartilages found to be hyper-mobile, internal one being removed and crucial ligaments trimmed. Incision made over outer surface of the thigh and an eight inch strip of fascia-lata removed, about $\frac{3}{4}$ -in. wide. From the posterior lateral surface of the internal condyle, this fascia-lata strip was inserted through drill holes and lashed, stitched, and fixed. This was stretched down anteriorly where it was attached in similar manner to the anterior lateral surface of the tibial tuberosity, forming an artificial internal lateral ligament stretched over the healed but lax original ligament.

Patient was allowed up on crutches in August and allowed gentle active motion assisted by physiotherapy. From this date on motion was gradually increased.

Exam. 3.7.21. Complaint, tires on long exertion. Walks without limp. Very stable joint. Noise has disappeared. Reports having had a bit of slipping three or four times, only slight. Ligament palpable. Lateral motion none, antero-posterior slipping very little.

On examination May 20, 1921, this knee shows little save slight fullness of all outlines, some atrophy of quadriceps still present. The abnormal mobility is very slight, the noise a slight grating only, the only complaint a soreness at times about the tibial insertion of the artificial internal lateral ligament. The ligament is more palpable than it was earlier, strengthening apparently with use.

This is my way of handling the loose traumatic joints. The first case, about 7 years ago, was moored with braided silk on both inner and outer side. The silk came out, as we later learned was the habit of silk so used, but the joint stayed stable and mobile. Since then I have always used fascia-lata "rope," run through drill-holes in under the cortical layer, running a bit obliquely from just in front of the axis of rocking on the femur, down and slightly back (this in case the femur goes forward, reverse if it tends to slip back). The new ligaments may be pulled very tight and laced and lashed with sutures. This operation does not open the joint, though I deliberately opened it to explore in this case.

In the half dozen cases in which I have done this operation results have been very satisfactory with no lax joints after operation, and I regard this as the operation of choice in the type called ruptured crucials, in which the joint has loose motion laterally as well as anteroposteriorly.

A little study shows which lateral, internal or external, is lax.

Save in rare cases in which one can suture back a torn-off spine, I can see no prospect of any stability in direct repair of crucials, or in any operation save the crossing in the notch of sutures or wires penetrating condyles and tibia in an X pattern, an operation discredited if silk or wire are used, untried, I think, with fascia.

Until and unless the criss-cross operation is so developed as to work, it is not too much to claim for the procedure here presented the place of first choice in *all* the traumatic loose knees.

Every trainer of athletes knows that crucials are not essential in knees otherwise strong—I am one stage nearer the matter myself—for I am "shy" of crucials in one knee, and a moderately able knee at that.

The operative procedure doesn't repair the crucials, but it does stabilize the knee.

Case 6 is an oddity. July 1, 1918, he was at work as ordnance inspector at Fort Strong, when a timber fell on his left knee. He was in hospital two months, then given light duty, then discharged. Since then disabled.

Admitted to this hospital Jan. 15, 1920. Examination of left knee shows limitation of extension of about 30 degrees—sharp, bony limita-

tion, and some backward luxation of leg. Crepitus is felt and heard over the internal side of the joint. X-ray shows old fracture of condyles with the back part displaced back and up, with the tibia, leaving a shelf in front, against which the tibia "chocks up" in attempted extension.

Jan. 30, 1920. Ether and operation. (Cotton.) Knee joint opened. "Corner" technique. Rather extensive bone plastic in remodelling of deformed condyles performed. Cast applied. Considerable reactive synovitis.

Feb. 24, 1920. Cast removed and physiotherapy started.

Examined March 7, 1921. Complaint: Discomfort in cold weather. Walks with slightest limp. Has practically full extension. Muscle development and power about normal.

Reports May 26, 1921. He complains only of "sharp shooting pains through leg after long walking in bad weather." "Can straighten better *some days than others.*"

Three cases were simple semilunar cartilage lesions.

Case 7. Gave a history of locking, occurring while at work, stooping, somewhere in France, and could recall no definite previous trauma. Referred by Dr. C. F. Painter of the Naval Hospital for semilunar cartilage. Typical history of recurring luxation of internal semilunar with fleeting synovitis following each "jamming."

Operation, 1920. Typical oblique incision on inner side with removal of the internal meniscus. Torn across not far from the front end. Front end of cartilage removed and the back part as far as scissors would reach. Nothing else found.

March 7, 1921. Practically perfect result. Full motion. No disability, though joint not quite as strong as normal.

In a report of May 25, 1921, he writes that he has pain in rainy weather, with a limp, "spasmodic pain at other times, but of short duration."

Case 8.

History missing. Torn internal semilunar cartilage of right knee. Arthrotomy by lateral incision. Removal of cartilage. Normal recovery.

Case 9.

In October, 1918, patient fell on left knee while running. Limb was injured to such an extent that he had to be assisted to his bed. He reported to sick call the next day and was laid up for six weeks. Patient has never been able to do a full day's work since the accident, and gives a history of locking at various intervals. Patient was admitted Aug. 17, 1920.

Examination reveals slight swelling of left knee, with considerable thickening of knee joint. Knee can be flexed completely but extension is limited about ten degrees. Has definite point of tenderness over internal cartilage.

Aug. 28, 1920. Ether and operation. (Cotton.) Usual *lateral* incision was made over left knee joint. Joint opened and internal cartilage, anterior end, found torn loose and dislocated backwards. This cartilage was removed in the usual manner. No arthritic changes noted. Knee joint closed and posterior splint applied.

Wound healed and gentle motions started in ten days. Patient allowed up on crutches in thirteen days. Manipulations daily. Physiotherapy started.

Examined: Mar. 7, 1921.

Complaint: None.

Full range of motion, no limp, good result.

In his report, May 26, 1921, he writes, "I consider the operation a good one in so far as the locking. I do not have this trouble any more, but the leg often gets numb and painful if I walk too far. Muscles in thigh have not yet come back to normal, but are growing stronger. Leg often goes out from me but does not lock. Pain mostly when going upstairs."

These three are average results, calling for no comment.

They were all done through the old-fashioned lateral incision, ample for a clean-cut case of meniscus trouble without complications.

Case 10.

This case is of interest because I postponed it so long with the best intentions, misled by the trifling *objective* external signs of trouble.

The patient was a vigorous man of 29 years.

First seen by me in spring of 1919, with occasionally recurring synovitis of left knee originally following slight trauma. Each attack with pain, local heat, some fluid. Physiotherapy, etc., tried out. Tonsils removed in December, 1919. He wearied of all this and finally prevailed on me to operate.

Feb. 1920, operation. Long "Corner" incision, and, to my surprise, very definite scars from pinching of the internal lig. alarium. Both lig. alaria and the internal meniscus removed.

Usual routine with motion after two weeks.

Recovery a bit slow even under baths and massage and exercises, but March 7, 1921, shows a knee slightly thickened as to capsule, with occasional sensitiveness and heat, but substantially normal.

My only claim to credit is the radical opening when I did open. A conservative operation would almost surely have failed to find the whole list of troubles, or to help.

His report of May 26, 1921, says "I feel a good deal better now than before operation, but when in close quarters I get a pain in the knee. When I am sitting down then I feel as if I would like to straighten it out."

Perhaps we have all felt something like this!

Case 11. Age. 32. Married. Admitted May 21, 1920.

Began to have trouble with knee in army about Sept., 1918, without any single trauma. Since then has been able to work for a while but at intervals knee swells and becomes sore and useless. Shows nothing on examination excepting swollen knee with capsular thickening of the villous arthritis type. Operation May 22, 1920. Cotton. Longitudinal "Corner" incision. Marked villous proliferation. Cartilages loose, both cartilages; these and a large amount of villous growth removed, including the ligamenta alaria on both sides. Splint worn until June 6. After this time active use with massage. Discharged first of July. Reexamined March 7th, 1921. Shows knee substantially normal though bony outline not as sharp as on the other side. Says he has occasional discomfort in it but nothing to interfere with the use of it to any extent.

Reporting May 26, 1921, he writes that he has no swelling but a "little pain once in a while. I am having the pain most on damp days. I can straighten it all right but I cannot bend it fully, and it is very tender. I am now able to put my knee on the floor and do some work".

This case is one of what we used to call villous arthritis—as good a name as any. At operation the fringes showed clearly enough that they had at times gotten in the way and has been pinched, sharply enough to leave clear scar traces.

The loosely moored semilunar cartilages were probably incidents only, they were not torn and showed no scars of pinching.

The removal of fringes and pannus cured the intermittent traumatic irritation and are giving the knee a chance to get well.

Four of the cases, the most interesting, I think, can claim a place as osteochondritis dissecans though I am not quite sure whether this is a diagnosis or what the physicists call a working hypothesis.

Case 12.

Diagnosis: Loose bodies, left knee joint.

On Feb. 2, 1920, patient twisted his left knee while at work in navy yard. Injury did not seem severe but began to trouble him after a few weeks and since then has intermittently laid him off work.

Admitted to this hospital March 5, 1920. Examination revealed movable body felt in left knee at inner aspect of patella. Painful to

pressure, motion not limited. Decision made to do radical operation, because of osteochondritic changes obvious in the X-ray as well as the loose body.

March 10, 1920. Ether and "Corner" operation. Cotton. Median arthrotomy. Removal of three loose bodies with excision of redundant fat pad; osteo-chondritis dissecans changes, mild grade. Knee put in plaster. Cast removed March 24, active motion started. Uneventful recovery.

Exam.: March 7, 1921.

Complaint: None.

Excellent result. At work at former occupation at Charlestown Navy Yard. Full range of motion. In this case the X-ray showed the joint mice and bone irregularities. There were patchy pocket erosions of cartilage at the condyle edges, particularly at the outer side, but nothing in the notch. The rest of the lesions were irritative, slight hypertrophic bone-cartilage edges, moderate thickening, much congestion of synovia and of underlying fat pads.

He reports May 26, 1921, that he has a little "clicking once in a while"—that he does not limp and has no pain; that he can straighten it fully and can bend it "within a little, but it is sore for a day or two after straining it as far back as it will go." "The shrinkage seems as though the fat all left at the operation and never came back." "It seems as strong as the other but I can not run."

It may be worth mentioning that he is a powerful, gigantic person, perhaps never a runner.

Case 13.

History of years of trouble with the left knee with occasional locking and subsequent synovitis of a few days. Never any locking of considerable duration. Tenderness (and point of apparent obstruction) to the outer side. On examination showed nothing objective save slightest blurring of bone-outlines and a little laxness of capsule and a little atrophy of quadriceps muscle. Slight abnormal mobility of tibia on femur forward. X-ray showed a small bone nodule in middle of joint. Operated on because of the intermittent crippling from displacement of the external cartilage, not for the laxity of the joint.

Operation March 7, 1921. Cotton operating. Cotting, Dunphy assts.

Ether anaesthesia.

Long sweeping incision carried $1\frac{1}{2}$ in. to inside of middle of patella. Skin and superficial fascia dissected back. Knee flexed, knife cut to patella, mid-line. Saw cut in vertical line about $\frac{1}{2}$ in. in. Patella then split with chisel placed in the long axis of the patella (not cutting

toward the femur) and opened up. Cut from ends of this fracture line through the tendon up to the top of the quadriceps pouch and down to the tibial tubercle, including the mid-line fat pad and the ligamentum mucosum. Joint then opened up and flexed. The bone node proved to be in the anterior crucial ligament from which it was shelled out. One catgut stitch in the slightly lax ligament. This node entirely within the ligament apparently grew there. External semilunar cartilage loose and showing the thinned out scars of many pinchings. The back half was displaced forward and lay in front of the femoral condyle, folded almost in contact with the front half. Whole cartilage removed.

The outer lig. alarium showed hypertrophy and distinct scarring and thickening from being pinched. This, the corresponding inner fringe, and much of the fat pad below the lig. patella removed, and the gap in the synovia brought together with catgut sutures in the fat not penetrating the joint. Joint washed out with salt solution. Knee then straightened and the joint closed—not too tight—with a few gut sutures in the tendon, not going through to the joint surface, and close suturing with kangaroo tendon of the periosteal fascial layer across the gap in the patella. Loose skin sutures of silkworm gut. Dressing—ham splint—no plaster.

(Later, motion begun at two weeks, splint off at three weeks. This case happened so slow almost no effusion or other reaction.)

Seen May 29, 1921, shows a practically normal knee:—muscles not yet back to normal.

Case 14.

First trouble with right knee in 1918 at Camp Dix, N. J., pain and slight swelling. No story of injury. A few months later in France had similar trouble which lasted longer. On return to U. S. had pain and a locking sensation and found a "marble" on the inner side of the knee which caused no trouble when "up" in the joint, but when lost in it gave pain and crepitus.

Operation May 6, 1921. "Corner" incision removal of loose bodies, removal of internal semilunar cartilage. One loose body, one lying in cavity in notch on interior side partly covered by crucial ligament expansion posteriorly, lying in a definite pocket, attached at its *base* (not at the sides) and leaving on its removal a floor which was dark, vascular, skinned over with light scar^d tissue. Some signs of joint reaction in dark color and thickening of synovial tissues and free oozing.

Treated as usual, still in hospital doing excellently well.

Case 15.

Dec., 1920, at Navy Yard, patient twisted right knee while stepping

from platform two feet high to a pile of angle iron. Knee pained severely but he worked till next day. Went to dispensary. Knee became swollen 4 or 5 times since. Then it developed habit of locking while walking with the accompaniment of severe pain and much swelling. Pain referred mainly to the popliteal space.

He was operated on May 9, 1921, with the usual Corner incision under ether anesthesia.

The joint was moderately congested with a moderate thickening of fat pads in front. Directly under the split patella lay a "Marble," loose, swiftly removed. Beneath this, lying well imbedded in the front expansion and body of the anterior crucial lay a second bone-cartilage body, no part of it exposed in the joint. This came out.

Farther behind, within the substance of the external condyle, filling a large pocket with its large bulk, sat foreign body No. 3. It was clothed over with fibro-cartilage, and was marble round. The "socket" was likewise rounded and clothed and on prying this mass loose from its (mainly basal) attachments there was almost no bleeding.

A trimming of edges of the socket, which lay far back in the external condyle, out of reach save in full flexion, a removal of a loose external semilunar, to make sure, and the usual removal of half the anterior fat pads before suture² included the operation.

The patient is still in hospital but has already (May 27, 1921) a neat looking, almost normal knee.

I have had lately a case, not an ex-soldier, whose case I am going to quote to help round out the series.

Mr. H., aged 43, an old athlete and always active, had had repeated traumata of late and particularly a heavy blow on the knee some eight months ago. The knee had been troublesome, had locked occasionally, and finally locked "for keeps" at about 20 degrees short of the straight line. Also it was painful, with a little fluid present. The point of tenderness was the internal semilunar.

Operation with the corner incision revealed some thickish fluid, general dark (pannus) synovia, very freely bleeding, and an internal meniscus thick and porky, torn near the front, the free edge turned back and in, the whole imbedded, like nothing I have met, in a big wad of granulation tissue and scar. Cartilage removed, fat pads in front halved as usual, various overlapping pannus edges trimmed, joint closed.

The locking is gone, the joint convalescing normally.

This series brings up two points. First, the nature of osteochondritis

² This is harmless, neat, and probably salutary as these pads are thick in all subacute cases, and I have latterly made this procedure my routine before closing the joint.

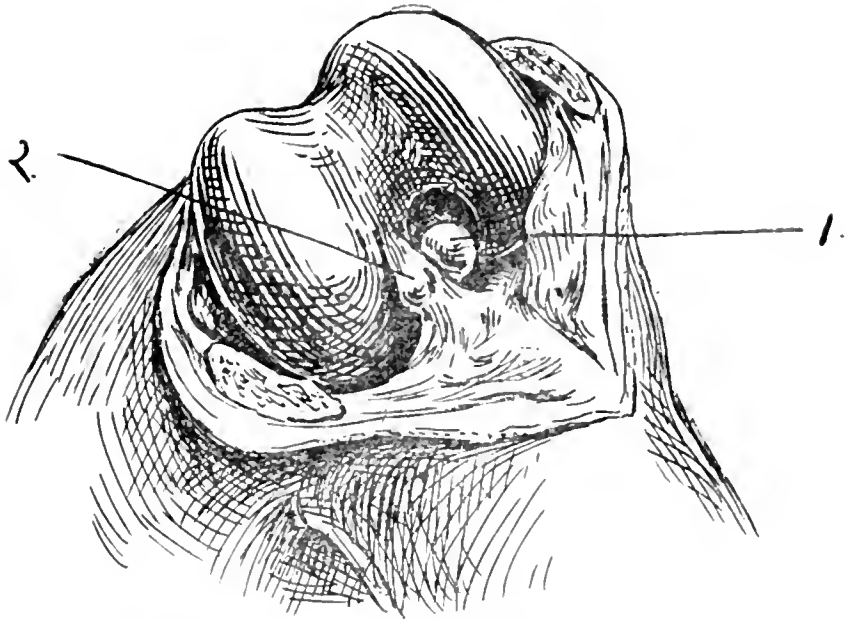


Fig. 1. Case 14. Operative findings. Two loose bodies, one imbedded in the ligament—no. 1 nearly free in its pocket—adherent by base only



Fig. 2. Case 15. Operative findings. Three loose bodies, one in the cruciate ligament, one free, and the third (No. 2) the plate lying deep down and adherent by its base to the floor of the pocket

dissecans, second, the frequency of secondary change from operation long delayed in cases of pure (or nearly pure) mechanical trouble in the knee.

I have been at some pains of late to get an answer to question 1.

What is osteochondritis dissecans? and why?

König described it in 1887.³

König seems to be responsible for the name of osteo-chondritis dissecans, and for the conception of a process of spontaneous dissecting out of loose joint bodies as opposed to the recognized possibilities of chip fractures with resultant loose chips, of cases of trauma to restricted joint surfaces with necrosis of limited areas and the throwing-off into the joint an area of discarded cartilage, and of cases of chipped-off osteoarthritic "osteophytes."

As was usual in the war-like Deutschland before 1914 there was a scientific "scrap."

Martens backed König.

Barth declared trauma,—direct,—and arthritis deformans, ample to explain everything.

And the "scrap" was "on."

Into this scrap, however, came Axhausen.

Barth, years ago, and Axhausen, later, have done so much for bone pathology, quietly and carefully, that they deserve a very careful consideration.

Axhausen, experimentally, produced joint cartilage necroses, and seems to have established that a necrotic sliver *may* become a free joint body, capable of growth.

Neuman and Suter (D. Z. for Chir., 1918) line up with König but inconclusively.

Kappis (loc. citat) notes the lack of repair of hyaline cartilage, and gives *some* data for the supposition of a non-healing crack in cartilage as the starting point of a dissection.

Ludloff worked out an elaborate theory of vascular interruption, a mechanical disturbance of the "arteria genu media," distributed through the cleft between the crucials to the bone tissue of the *internal* condyle next the notch.

Inconveniently, also the external condyle is sometimes affected in this process, see case 14.

Codman, in this country noted the cases of traumatically contused and exfoliated chips.

³ The completeness of us state that Kappis—Deutsche Zeitschr. f. Chirurgie 1920—Vol. 157, pp. 467 ff.—in an admirable review credits Broen (1854), Klein (1864), Paget (1870), Poulet and Vaillard (1885), Brodhurst (1897), Poncet (1891), and Krueghind (1898), with contributions on or toward this actual subject.

There is no doubt that these cases occur and that the bone undergoes partial or complete aseptic necrosis while it is enveloped by the growing cartilage that keeps up an effective though a lower class nutrition merely by sucking in the synovial fluid.

There is no case of this class in our series, unless perhaps case R.

Ridlon, J., Jour. A. M. A. 1913, vol. 61, pp. 1777-80 called our attention as to the conception of an osteochondritis dissecans process as such.

Bracket Am. J. Orth. Surg. 1917, Vol. 15, pp. 79-94 gives an interesting and clear citation of cases.

Nevertheless I am a bit at a loss.

Now as to our 4 cases. Case 12 *might* be one of bodies grown from clipped off osteophytes, for there was an arthritis and there was no defect to account for the origin of the loose bodies.

Case 14 does for Ludloff's theory because the *external* condyle was affected.

Cases 12 and 15 both showed defects so far back and within the notch as to preclude any *possibility*, even, of direct trauma.

Cases 12, 13, 14, had definite bodies *within* the crucials, with untorn crucials, with bodies not in contact with bone (disposing of any theory of avulsion by ligament, I think.)

Cases 13 and 14 showed a distinct dissecting process, in one case leaving a vascular, in the other an avascular base and *both* showed excentric growth of the separated portion.

In both the socket seemed made to fit the ball!—just as one sees below a fall in a mountain-brook a round rock that has worn its bed into the ledge through countless centuries of attrition. In the knees, however, the “marble” grows—perhaps the socket also. One can not escape this impression, and, moreover, so far as my data (and those I can gather) go, in the knee as in the brook, if one removes the marble, attrition stops. Perhaps this is more important even than how the marbles are made.

The second point in question is that of operative interference in general and of technique.

No one is likely to dispute the wisdom of taking out foreign bodies or torn displaced semilunar cartilages, etc.

The real point illustrated I think by this series is the frequency of *secondary* changes in lesions essentially mechanical of a variety of kinds.

That the results, in this series of comparatively late interventions seem to be good, is of no conclusive value, for these men were, as a rule, young, “husky” and without essential unsoundness.

What I think it is fair to infer is that *all kinds of mechanical defects*

in the knee-joint, neglected, may lead to serious secondary changes in the joint, changes that will not, after a time, resolve themselves to normal, even with the irritant gone.

I know that my experience of the last two years in knee-surgery has made me not conservative but radical and radical as to early operation.

One must have proper technique, proper operating room fittings, and personnel, proper experience and the judgment that should result therefrom.

All this is not beyond reach.

Given all these little things, *together*, the man with a knee gone wrong had better have it "looked into" rather than wait for the development of serious, perhaps irremediable, secondary damage.



VENEREAL PROPHYLAXIS¹

PY LIEU L. COMMANDER JOAQUIN SANCHEZ GOMEZ (M.C.)
Royal Spanish Navy and Attaché to the Spanish Embassy, Washington, D. C.

THE most important conquest in the field of hygiene lies in the extinction of venereal diseases, of which syphilis and blennorrhagia are the most important on account of their malignity and attendant consequences which affect not only the individual but the species as well. The banishment of venereal diseases from the field of pathology, as has been done with smallpox, gangrene, and other chirurgic infections—operative and post-operative—is to accomplish a great deal for the benefit of mankind.

Since my post graduate internship (1902) in the Hospital of San Juan de Dios, Madrid, Spain, which specializes on the treatment of venereal diseases, I have devoted myself to the study of venereal prophylaxis, especially that form relating to blennorrhagia. If the urethra is a potential passage and unreal, in what manner does the initial infection take place in the act of sexual copulation? This question cannot be reconciled either with the prevailing doctrines on prophylaxis nor with the alleged cause of contagion of blennorrhagia, with the result that the treatments now employed are inconvenient, more painful, and less effective than those applied by my method for which I claim greater simplicity and suitability.

The bacteriological investigation which would bring out into relief and stamp as authoritative the extra-urethral, exterior infection of blennorrhagia was not easy to accomplish on account of the limited subjects made available for this peculiar study.

As time passed and while still an interne, my views on the question became more and more pronounced. If the urethral duct is only a potential duct and not real, in what manner then does the initial infection take place? The emission and ejection of urine or semen separates the urethral walls, and by this act produces an actual channel, but upon completion of this action the walls again come into contact, thereby closing the passage.

Another fact of great importance which further confuses the present theory of the initial intra-urethral infection is that the emission and ejection of urine or semen is an exterior operation with the result that the mechanical action tends to clear the germs within the urethra. In carrying out this theory hygienists advise urination after copulation

¹ Address delivered at the 29th meeting of the Military Surgeons of the United States of America at Boston, Mass., June 2-4, 1921.

in the belief that the germs within the urethra are expurged thereby. That this is not a specific remedy is unquestionable because blennorrhagia is contracted notwithstanding the fact that the advice may be followed.

After one year's service in the Navy, I was detailed as the medical officer on board the gunboat *Don Alvaro de Bazan* (June, 1906), and as happens amongst a young and virile crew, a great many of the men were ill from blennorrhagia, chancre, and syphilis, to such an extent that the Commanding Officer became alarmed by the number of hospital patients and consequent reduction in the strength of the crew for duty. The Commanding Officer informed me that he was determined, by whatever means, to change this condition, and requested of me suggestions in order to accomplish the desired result. I think it is only just as a tribute to the Commanding Officer, who was so interested in the health of the navy, to say here that he is none other than Admiral Don Federico Ibanez y Valera (then frigate captain).

I availed myself of the opportunity I had so much wished, to conduct the bacteriological examinations of the penis and the labia of the urethra, which in my judgment were the only places of initial contagion.

About this time I learned that the medical officer of the cruiser *Extremadura* possessed a good model traveling microscope, his own personal property; with barely a speaking acquaintance, I appealed to the generosity of Dr. Gutierrez Pallardo, who was good enough to loan the instrument to me. Once in possession of the necessary equipment, I was able to make various cultures from the preputial smegma of the gland and urethral openings, taken from sailors, who had had recent sexual contact with prostitutes while on their shore leave.

For the purpose of these investigations the most unclean were considered the more suitable subjects and were therefore selected for experimental purposes. After taking numerous microscopical observations, and overcoming many difficulties, I was able to finally locate the gonococci of Neisser and related cocci, from specimens taken from the products of the gland or from the labia of the urethra, but what is of vastly more importance, I saw, without the least doubt, blennorrhagia in subjects from which positive results had been obtained; in the latter, I was unable to find the gonococci either in the navicular pit or in its vicinity until after the third day after sexual copulation had taken place.

The demonstration that the initial contagion is in the visible parts of the gland of the prepuce and labi of the urethra, was conclusive proof of my conception of extra-urethral contagion and the subsequent infection of the urethra several hours after copulation, as the gonococcus

is not found in any appreciable depth nor does it appear in the interior of the urethra until after an average of forty-eight hours have elapsed since copulation.

The true action of gonorrheal contagion having been found, I then resolved to investigate the field of therapeutics for antiseptics which, while not irritating to the skin, would be the effective poisons for the gonococci.

The manner of infection of syphilis and venereal chancre, by contact of the *spirocheta pallida* of Saudin or the bacillus of Dueray with skin bruises, no matter how small, being well known, it would appear that the antiseptic measures have but little effect. Such is not the case, however, as I have been able to prove. The general action of inoculation, especially that of syphilis, is as follows: The germs enter what may be called the field of inoculation (bruises, sores, wounds, etc.), and with particles of lymph and blood oppose the exterior agencies; these tend to develop the recognized phagocytic action of fixed and mobile cells, the chemical effluvia action, and coagulation, which envelops and isolates them. The factor of coagulation, as we shall see later, can be likened to a two-edged weapon which under certain conditions may favor inoculation.

The condition which especially favors inoculation in the first place is the increase of the number of germs in this so-called field of inoculation (bruises, punctures, wounds, etc.), due to the fact that inoculation generally takes place with a relatively small number of microbes. In syphilis the original infection does not abound in germs, and it is well recognized that the most contagious lesions, such as papulas, do not contain a great number of them. Another factor worthy of consideration is that coagulation imprisons and retains the germs and if the initial defensive preparations have been inadequate or insufficient, their multiplication follows.

It should be borne in mind that I only refer to the initial action of inoculation, which most interests us in venereal prophylaxis, and not to the ulterior evolution of inoculations, which is of value to the pathologist in his treatment of the malady produced.

Intimately related to these factors is that called the period of incubation, and it is very evident that time is essential for microbial reproduction and for their entry into the tissues, because during the first hours the microbes are to be found only on the surface of the field of inoculation; it is at this time that antiseptic measures, particularly those that exercise action in depth, are effective. We shall presently see the results that have been obtained in practice.

I have succeeded in freeing monkeys from infection, and in sterilizing

experimental inoculations according to the established practice of Metschnikoff, by bathing the zone of inoculation with antiseptics mercurial solutions five minutes after infection from monkeys which have not been submitted to an antiseptic bath.

As to the contagion and prophylaxis for venereal chancre, I have no comment to make; it does not materially differ from syphilitic chancre; and, it can be said, moreover, that the mixed chancre is nothing more than an infection allied to the spirochoeta pallida of Saudin and the bacillus of Dugray.

The fundamentals for the action of contagion and the efficacy of antiseptics having been established, I experimented with certain antiseptic solutions which were non-irritating, either to the skin or mucus membranes, and possessed of specific microbial strength to penetrate to the necessary depth. In order to attain this end, bathing is considered the best remedy on account of the moderate macerative action. Heat is also an essential because of the softening effect and the power it gives to antiseptics in general; for heat, as is well known, increases the strength of antiseptic substances while grease diminishes them. In practice, complete results were obtained and the methods employed were extremely simple.

After I had conducted these investigations I read the letter written by Reid to *The Lancet*, page 694 (London, 1917)—ten years later—and his book on "Prevention of Venereal Diseases," which absolutely confirmed the studies that I had carried out for a considerable time prior thereto.

In the *Boletin de Medicina Naval* (Page 262, Madrid) there was published an article over my signature containing the character of the greater part of the researches as indicated in this paper. My efforts in this work were witnessed by persons of unquestionable honor and integrity; while my tours of duty on board the gunboat where this method was used under my personal direction, namely, *Don Alvaro de Bazan* (1906), and the corvette *Nautilus* and cruiser *Pelayo*, are official, and the data can be easily obtained if desired.

The sailors who returned from shore were required to bathe and wash all the member for a period of five minutes, opening the urinal passage so that the urinal openings were bathed as well, but only in the accessible and visible parts which naturally had come in contact with the vaginal zones of the women, with a solution of Oxicianide of Mercury. Although the results obtained were complete, and the sailors who had submitted to this genital treatment were not infected with blennorrhagia syphilis or venereal chancre, I also tried a solution of fenol-di-sulfanæ of sodium and of mercury (Hermofenil), because of

the antiseptic, non-poisonous, and non-irritating properties for the skin and special efficacy against the *treponema pallida* of Saudin and the gonococci of Neisser. The results attained were very good; no sailors became infected when the disinfection took place within six hours after sexual copulation.

I also prepared a salve of vaseline, glycerin, protargol hermofenil, and xilol, which gave me excellent results. The salve, however, soils the clothing, and its application and portability are more complex and vexatious. The oxiciyanide and hermofenil are prepared in a compressed form and the solution in water is made at the time it is needed for use.

The investigation of Metschnikoff in the use of calomel salve at 30 per cent, I understand, leaves no alternative but to smear the skin of the genital organs prior to sexual copulation. Its use after copulation is less effective than the other antiseptic used by me, which, on account of being soluble, possesses better disinfecting qualities.

That salve, as a venereal prophylaxis, is not successful in women, becomes a matter of very great importance for the absolute extinction of venereal diseases. I claim for my method the same results in women as in man for identical reasons. It can be stated that there is no good reason today why these diseases should not disappear within a short time, as have smallpox, malaria, yellow fever, etc., from those countries that have used the measures proposed by modern hygiene. In order that women may attain an effective prophylaxis, it is necessary, that the vagina and exterior parts of the genital organs receive abundant irrigation and thorough washing for a period of five minutes with a solution of oxiciyanide of mercury at one to one thousand or with a solution of hermofenil at 3 per cent. If this latter is used, care should be taken that the preparation be made in cold water at 20 per cent, and to add later hot water until a concentration of 2 or 3 per cent is reached, at which grade hermofenil should be used.

I consider that the application of salve in women is less effective and less convenient than the system of irrigation and bathing, which are not only more efficient but much cleaner.

CONCLUSIONS

First.—The injections and intra-urethral irrigation, which are today practiced as a prophylaxis for blennorrhagia, are unnecessary and painful because the original infection of gonococci of Neisser which takes place in the first hours is extra-urethral.

Second.—Thousands of disinfections practiced first by me and ten years later by Reid, in the English Army, by the use of only an extra-urethral wash and antiseptic bathing, confirm the practicability and efficacy of the system.

Third. Syphilis and venereal chancre are avoided by this system.

Fourth.—It is effective in men and in women.

Fifth. Antiseptic solutions are preferable to salves because the greases diminish the power of disinfection. Salves change with ease; they are more difficult to carry than the compressed solutions and are necessarily filthy upon application.

Sixth. - The effectiveness of the prophylaxis diminishes greatly after the sixth hour following sexual copulation.

Seventh.—The salve of Metschnikoff, as well as other salves, are only effective when the genital organs are smeared for cohabitation. The user is put to great inconvenience and, therefore, does not use them.

Eighth. My salve of Glycerin, Xilol, Protargol, Hermofenil, possesses more effective prophylactic properties than preparations of calomel, on account of the components being soluble; the Xilol, in addition to producing a great antiseptic action in depth, its volatility gives to the salve an agreeable odor.

Ninth.—I have in my possession and at the disposition of those who may desire to substantiate my claim, the records of disinfection made on board the corvette *Nautilus* and the cruiser *Pelayo*, with the names of the seamen who first used my system and the results obtained. The commanding officers, at that time, of the *Pelayo*, *Nautilus*, and *Alvaro de Bazan* could also give testimony concerning the investigation and results. These officers placed at my disposal all of the facilities within their power for this work, for the good of the Navy. I desire to take advantage of this opportunity to give you their names in gratitude to them, as follows: the cruiser *Pelayo*—Admiral Excmo Sr. D. Pedro Vazquez (then the captain of the Navy); the corvette *Nautilus*—Vice-Admiral Augusto Duran de Cottes (then captain of the frigate); *Don Alvaro de Bazan*—Excmo Sr. D. Federico Ibanez y Valera (already mentioned above).



MEDICAL ASPECTS OF NAVAL AVIATION¹

BY LIEUTENANT J. E. NEIBERGER,

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I CONSIDER it a great privilege to speak before this distinguished Association on such a new and important subject as Aviation. I must necessarily say naval aviation, as it is the only subject I have any experience with, and my knowledge of land planes is limited to types used on board battleships and aeroplane carriers. I believe, however, that the medical problems of naval and military aviation are very closely associated, excepting perhaps the physical examination of pilots and candidates for aviation, in which at the present time the physical examination must necessarily differ, owing to the different construction of sea or hydroplanes.

Events of the past few years have clearly demonstrated that a strong and well organized air service is a vital necessity of a modern fighting machine. Without an efficient air service, an army or navy is blind and impotent and at a great disadvantage and practically helpless against an adversary so equipped. The strength of an effective air service is measured in great numbers of aircraft, properly manned and organized into efficient fighting units. A highly trained, specialized personnel must be provided for such a service. Not only mechanical training, knowledge, and experience are essential, but more important is the physical and psychological make up of the personnel so engaged in this important duty. Without an efficient personnel, no efficient air service is possible. The psychological make up of a person engaged in flying is of primary consideration, much more so in aviation than in any other branch of the service. A good physical and intellectual specimen is highly desirable for a pilot, but does not necessarily make a good pilot.

It is in connection with problems of training personnel and looking after their physical condition after training that the Medical Officer has a most important duty. Besides numerous problems present themselves daily on an active flying station, which necessitate the advice of the Medical Officer.

To a far greater extent than is generally realized, a successful future for aviation depends upon the mental attitude and physical fitness of the personnel. I believe that seventy to eighty per cent of the flying

¹Read at the 29th Annual Meeting of the Association of Military Surgeons, of the United States, Boston, Mass., June 2-4, 1921.

accidents are due to what may be called the human element and I think that most Medical Officers engaged in aviation duty will confirm this statement. May I tell this organization, that in my personal experience with numerous crashes, I know of only few in which the fall was due to a mechanical defect of the plane or engine. It is, therefore, obvious that utmost care and special methods must be employed in the selection of the airmen. Physical and mental aptitude alone do not make an aviator, he must have the potential ability to acquire the mechanics of flight. It is the duty of the Medical Officer to watch over the aviator's flying, to see how pilots are withstanding the effects of flying and to take steps to combat at an early stage the onset of flying stress and to prevent undue fatigue, in justice to the aviator himself as well as his companions and passengers, leaving entirely out of the question the material damage, which of course is of little consideration in comparison to human life. From the statement above one can readily see that the most important factor to be considered in flying is the flier himself. Periodic medical examination is, therefore, a very important factor, and how this examination is to be most successfully conducted is still a question of debate, although a great number of rules for examination have been laid down and have been most successfully employed. It is of the utmost importance that Medical Officers shall be thoroughly cognizant, not only of the methods employed on their own stations, but also of those used on various other stations and also in foreign countries. It was the above-named facts which brought me to the conclusion to appear before this Association to present to it a few of the aviation problems, in order to obtain the help and advice of other Medical Officers engaged in this work, and with their co-operation and renewed efforts for new thinking along these lines bring flying to a high degree of safety for the pilot and his companions.

PHYSICAL EXAMINATION OF NAVAL AVIATORS

The subject of examination of naval aviators is of great interest to the Medical Officer and of the utmost importance to the Naval Service. This examination not only includes the examination for student naval aviators, but also periodical examination of aviators after qualification. The examination of airmen must have as its indispensable complement the control of their physical health, the study of organic changes and of functional failures, which may appear in the course of aerial service. The Medical Officer must always carry in mind that the pilot is a combatant, that the task of an airman is an extremely hazardous and heavy one and to carry it out not only requires dauntless courage, but also a perfectly healthy body, able to stand work under conditions ex-

tremely unfavorable for the proper functioning of all organs. The Medical Officer is, therefore, responsible:

1. That an applicant possess the necessary physical qualifications for flying.
2. That an examination of the qualified aviator is periodically and thoroughly conducted.
3. That those pilots placed in charge of training are fit for this important duty.

The Physical Examination of Candidate Itself.—At the present time, in the United States Navy, the same specific examination is laid down for all aviators. Naval Aviation, however, is divided into two branches, namely, heavier-than-air and lighter-than-air, heavier-than-air including airplanes or seaplanes of all sorts and lighter-than-air including dirigibles, free and kite balloons. The requirements of a lighter-than-air pilot, however, must essentially differ from the physical requirements of a heavier-than-air pilot. A man with an average physique might make an excellent lighter-than-air pilot, but he cannot handle an H-16 or any other heavy seaplane where physical strength and endurance are required over a long period of time. I believe that the minimum weight of any heavier-than-air pilot in the Navy should be one hundred and fifty (150) pounds, and no deviation below this weight should be allowed. It is preferable to have the applicant weigh more than one hundred and fifty (150) pounds. There are no planes of any type in the Navy today where the services of a light man are required. The public has an idea that an aviator should be light, and one would naturally think so, but any one piloting an H-16 or F-5-L type of seaplane in bumpy air will quickly change his mind. It takes considerable strength and endurance to handle a big boat under these conditions. The best physical specimens of aviators are often in danger on account of bumpy air. Men weighing less than one hundred and fifty (150) pounds should not be trained in heavier-than-air craft, unless they are constantly retained for small seaplanes or scout duty, which is not the policy of the Navy at the present time. In order to obtain a certain standard in regard to height, weight, and muscular development, the following methods are recommended. The first method is known as the "factor of Bouchard." The factor is represented by P/H . P is the weight in kilograms and H is the height in decimeters. The average of this factor gives a first indication of wasting or obesity. This factor, however, only gives a preliminary indication. It may range from one to seven. No one under 3.9 or above 5.0 should be accepted. If, for instance, a man weighs one hundred and forty (140) pounds and measures sixty-eight (68) inches, then the factor would be as follows:

$$\begin{array}{rcl}
 140 \text{ lbs.} & = & 63 \text{ kilograms} \\
 68 \text{ in.} & = & 172 \text{ centimeters} \\
 \text{Therefore } 63 + 172 = & 37
 \end{array}$$

The man is, therefore, under passing mark.

Another index of measurement, which I consider better than the previous one, may be taken from the formula $(P+p) - T$, P representing weight in kilograms, p the circumference of the chest in centimeters, T the height, also expressed in centimeters. The average constant for qualified subject is -20 . The further the figure falls below this mark, the better will be the general constitution of the man under examination. I checked all the pilots on our station by the above methods and found that those pilots who came furthest below this mark not only were the best physical specimens but also were the best aviators and had the reputation as such on the station. All pilots tested had their physical examination previous to their reporting to our station, and were not originally examined by this Medical Officer. I picked out for the illustration three fliers, who are all heavy seaplane pilots. The first man has the reputation of being an excellent pilot, the second is a fairly good pilot and the third one has been reported to me by the squadron commander as having a great deal of difficulty in handling a large plane.

OFFICER NO. 1.

EXCELLENT PILOT.

Weight,	187 lbs.	= 83 kilograms
Height,	70 $\frac{1}{2}$ in.	= 187 centimeters.
Chest (means),	38 in.	= 98 centimeters.

$$(83+98) - 187 = -6.$$

OFFICER NO. 2.

Weight,	147 lbs.	= 66.5 kilograms.
Height,	66 in.	= 167 centimeters
Chest (means)	34 in.	= 86 centimeters

$$(66.5+86) - 167 = -14.5$$

OFFICER NO. 3

Weight,	121 lbs.	= 55 kilograms
Height,	68 in.	= 172 centimeters
Chest (means),	30 $\frac{1}{2}$ in.	= 77 centimeters

$$(55+77) - 172 = -40.$$

The height of a naval aviator should not be less than sixty-seven and one half (67 $\frac{1}{2}$) inches. No small man should be accepted as a big seaplane pilot, as he does not possess sufficient height to reach the rudder bars with his feet. I have seen numerous pilots who had to have special devices made for them to enable them to reach the rudder bars, thereby making up for their deficiency in height. In discussing the above requirement, numerous arguments are advanced claiming that these requirements are being too stringent. It is stated that in the near

future the mechanism of the seaplane will be such as to enable the pilot to control all movements of the plane mechanically. Granting this to be true, the fact remains that in aviation today the human element is the most important factor, and any kind of mechanism, no matter how perfect, is liable to defects, and should the aviator encounter any difficulty while in the air due to mechanical defect it is then again necessary to possess the necessary physical strength and endurance to handle the plane and pilot himself to safety.

PHYSICAL EXAMINATION OF QUALIFIED AVIATORS

I believe that a periodical examination of the aviator should be made and he should be kept under constant observation and supervision of the Medical Officer. The examination should be made at least once a week. The reason for the examination is to determine whether the flier has developed any physical defect, and what is more important to a flier whether any symptoms of staleness are present. This condition is observed quite frequently in old fliers. Many theories have been described in connection with this condition. The stale aviator is a type in which there is poor muscular control over balance movements, fine tremors of hands and eyelids, greatly increased reflexes, loss of sleep, hyperexcitability, and nervous irritability. Some authors claim that this condition manifests itself more readily in those fliers who repeatedly ascend to high altitudes, having a poor compensation and an unstable nervous system. While there is no doubt that frequent flying in high altitudes is going to affect the nervous system, it has been my experience that this condition develops in persons who never flew over four thousand (4,000) feet within a period of six (6) months. There must be, therefore, other causes than altitude and oxygen deprivation. I believe that too much indulgence in alcohol and the bright lights of a great city with tendency towards over exertion in many ways has been the cause of the loss of many a good flier to the Service. It is often claimed, however, by aviators that a man can fly better when slightly under the influence, of alcohol, and that intoxication removes the fear or consciousness of himself, enabling him to direct his entire attention to the management of his plane.

My experience, however, does not confirm the above statement. Excessive alcohol will remove inhibition so that the flier becomes reckless and does not use his best judgment in case of difficulty. Major Dunlap at the Research Laboratory, Mincola, has shown by experiments that alcohol produces the same effect as high altitude or low oxygen. It is very easy for a pilot to lower his physical condition to the point of uselessness by the constant use of alcohol. He may be able

to fly, but he is not flying at his best. Clouded brains from hangovers are not fit to direct in air or seaplane. It is believed that an examination should be made on Monday morning, but other days of the week should not be neglected. Whenever a Medical Officer notices anything abnormal about a flier, he should immediately put him under observation and determine the exact cause of the abnormality. Fortunately, this condition of staleness can easily be corrected by giving the aviator a certain amount of rest and relieving him from all flying duty. This, however, is not always an easy task, and many objections are raised by the Commanding Officer and also the Squadron Commander. The Squadron Commander wants his pilots to obtain as much flying time as possible, but it is far better and more will be accomplished in the end if the pilot not in good physical condition be not allowed to fly. If this rule would be followed on every flying station, it would result in the saving of many a flier. Also, the flier himself would then come to the Medical Officer and tell him when he is not exactly feeling right, he being the first one to know his condition. Under present conditions pilots hesitate to approach the Medical Officer and tell him that they do not feel like flying, and prefer taking a chance in going up into the air than displease the Squadron Commander, who looks upon a pilot who is repeatedly placed upon the sick list with distinct disfavor. A great deal of tact is necessary on the part of the Medical Officer, but if a pilot constantly appears with a lowered resistance, he is not performing his duty faithfully and his attention should be invited to this fact.

FITNESS OF THOSE PLACED IN CHARGE OF TRAINING

As soon as a candidate is found physically qualified for training, he is turned over to an instructor who assumes charge of the candidate until he qualifies as an aviator. Despite the fact that certain candidates possess all the necessary physical qualifications essential for an aviator, when it comes to actual flying they are a total failure. It is the duty of the instructor to immediately eliminate all such candidates. Close cooperation between instructors and the Medical Officer should, therefore, exist. Not infrequently an instructor will tell the Medical Officer that he simply cannot teach a certain candidate to fly, or as the instructor usually expresses it, "This man has no flying sense." Instructors have a very important duty to perform and should be carefully selected. It is up to them to see that the student is thoroughly familiar with all the rules and regulations, fundamental for flying. He must decide when the student is capable of flying alone. He must report all candidates of unsatisfactory progress to the Squadron Commander and Medical Officer. The instructor must, therefore, be a man of good

mental ability, good moral character, have tact and good judgment and must be a good flier. He must keep himself in excellent physical condition, and be constantly on the alert, so in case his student puts him in a difficult position it is up to him to pilot the student and himself to safety.

PSYCHOLOGY OF FLYING

I cannot close this short synopsis on physical examination without saying a few words on the psychology of flying.

The psychology of flying covers a vast field, which an ordinary observer finds extremely difficult to traverse. The function of psychology in respect to the aviator is to study his adaptability to the work required of him. Assuming that the physical qualifications of the aviator are adequate and that his mechanical physiological functions are satisfactory, it still becomes necessary to determine the conscious or integrative action of his organism with regard to his adaptations, which make him a good flier. It is believed that the psychological examination is of equal value to the physical examination, especially in heavier-than-air craft duty. The personality of the aviator and his flying aptitude should be studied. All psychologists know that in the act of learning difficult problems there are often definite periods of lapse in improvement due to difficulty in adjustment of the organism and also to change in attitude of the learner. This is particularly true in teaching a student to fly. There are numerous factors which bring on the above condition and it should be thoroughly understood by the instructor. Also, on numerous occasions pilots have told me they did not feel like flying. This statement should always receive careful consideration.

As to the personality of the aviator, no general rule can be laid down. It has been my experience that quiet, methodical men make the best fliers. A statement often heard is that, even-slow minded subjects or those seemingly lacking initiative have in many instances proven to be premier pilots. I found this statement to be absolutely true, but these individuals are usually clear thinkers and make rapid mental adjustments. The nervous, high-strung, quick-thinking, or those bordering on the temperamental, are the least reliable. They often become good fliers, but cannot be relied upon. Seemingly slow thinking individuals are usually very cautious.

THE ART OF FLYING—HUMAN ELEMENT

Despite the large amount of aeronautical research in progress, the fact remains that at present the pilot provides the controlling and coordinating mechanism on which the satisfactory performance of the

aeroplane ultimately depends. From a medical point of view the pilot adds the aeroplane to himself; engine controls and other appliances are appendages to his hands, the rudder an extension to his feet. By appropriate movements of his upper and lower limbs, man is now able to fly.

It is for this reason that medical men attach great importance to the human element in flying, an element of all the greater importance, since flying takes man into the third dimension and into a state of relative instability as compared with his previously limited movements on the earth's surface. To acquire the art of flight, therefore, a number of controlled and coordinated movements are necessary. A man must be possessed of aptitude, otherwise he will not acquire the art of flying. In the apt student these coordinated movements are at first all made as the result of conscious effort, but later they pass into the realm of the automatic (subconscious), so that the expert pilot does not have to think how he flies, he just wishes his machine to perform a certain evolution and it occurs.

The fact that flying eventually becomes automatic, the same movement of hand and foot should bring about the same evolution on various types of machines. In other words, machines should not be so dissimilar in construction of controls that the action of hand and foot which means safety on one type of machine may mean loss of control on another type. The pilot should instinctively perform the correct muscular movements without having to call to his consciousness the fact that he is on some special type of machine.

To initiate the coordinated movements necessary for flying the pilot relies upon certain sensory impressions, of which vision is the most important. Without facilities for using his eyes a man is not able to fly. It has been found that experienced pilots cannot satisfactorily perform even a simple evolution with the eyes blindfolded. For example, a very expert pilot who felt confident he could fly a machine blindfolded and do a forty-five degree turn found he was quite unable to do so. It is also well known that a pilot cannot fly level in a fog. This is due to the temporary eclipse of the sense of vision. Successful fog flying will depend upon the use of instruments designated for this purpose. Besides good visual acuity, much depends upon correct and harmonious working of the various muscles moving the eyeball. For correct judgment of true distance both eyes are necessary and they have to work in concert. It has been found that such harmonious working of the two eyes is lacking in a large percentage of pilots, who are constantly making bad landings. This defect can be overcome by constant training in landing. It has been the writer's observation that this

defect is oftentimes noted in pilots of good flying ability after a long period of service and especially after long flights. Lieutenant Walter Hinton, who was pilot of the NC-4 on the first transatlantic flight, stated that he noticed after landing in the Azores, from Trepassy Bay, a ride of sixteen (16) hours, that the movements of his eyeballs were incoordinated and it was an effort for him to control the movement of the eye. He stated that he thought that it was due to the goggles. Several of the other pilots have had the same experience. For successful flying, next to vision and perhaps almost equally important are the sensations commonly known as "feel." A pilot flies to a great extent by the feel, altogether so when in training and flying with small boats. According to some authorities, it has been thought very necessary that a man should have a good sense of balance, but experience has shown that this balance sense is not sufficiently developed in any man to enable him to fly level in a fog. Great importance was at first attached by some medical authorities to the so-called vestibular apparatus of the ear, under the belief that an airman flies largely by the aid of this mechanism. The idea arose mainly because in birds this mechanism is greatly developed. Stringent tests in a springing chair were applied for the testing of this apparatus, but experience has shown that if these tests had been vigorously applied a number of very successful pilots would have been rejected. The spring chair is only of value to determine the subject's tendency to giddiness or nausea and vomiting in the air, especially when a previous history of swing sickness or train sickness exists. It is to be borne in mind that most modern planes have a considerable inherent stability, so that with good visual judgment and the correct degree of muscle coordination, a pilot can thoroughly ensure the stability of his machine.

THE DUTIES OF THE MEDICAL OFFICER

In writing this article, I had intended to speak about numerous other subjects connected with aviation, such as organization of the Medical Department and its equipment, air or altitude sickness, aviation ships, gases used in aviation and their effects, aviators' appliances such as glasses or goggles, ear protectors, helmets, and clothing, but this is impossible owing to the limited amount of time. Before closing, however, I must say a few words about the duties of a Medical Officer assigned to an aviation station. The Medical Officer in the Navy has not fared as well as the medical officer or flight surgeon in the Army, in that he never officially receives instructions in actual flying of aircraft. The Navy Department, however, has never voiced any objection to a medical officer in the Navy taking flights or training, providing he

finds an instructor at a station willing to give him flight instructions or have the pilots take him up for a flight, whenever he desires to do so. Fortunately, I have found that all pilots fully realize that the medical officer is looking out for their health and comfort and safety, and they are always more than willing to assist the medical officer in any way possible, and only too glad to help him in any way they can. This fact is rather encouraging to a medical officer assigned to a naval air station, whose duty is rather a hard one in comparison to other stations, as in addition to medical and surgical care of the personnel, and sanitation of the station, he has the care of the fliers and must spend a good deal of his time with problems in connection with flying.

A medical officer assigned to aviation duty must have a thorough knowledge of internal medicine, including physiology and psychology, and he must be able to make thorough eye and ear examinations. I believe that every flight surgeon should take a special course in eye, ear, nose, and throat at some good post-graduate school, or hospital. The flight surgeon must be familiar with the modern methods of hygiene. A medical officer selected for aviation duty should be selected with as much care as the pilot. With deep and interested self-devotion to his work, he must be unselfish, approachable, gentlemanly, at the same time possessing firmness, and must have all other qualities which are expected of that type of physician who has been looked upon for centuries as the kind, human, self-sacrificing benefactor of mankind. He should be capable of becoming engrossed in air problems, and see and experience them himself in the air, as most aviators are very reticent in telling their difficulties and defects, which they notice while flying. For that reason the medical officer must be a good mixer and must obtain the implicit confidence of all pilots and should spend as much time as possible in informal association with them. I have made it a practice to be at the flight office as often as practicable, whenever the pilots "take the air." Half of the fliers are usually watching the others, and one can obtain a lot of valuable information from their remarks and general conversation. I believe the medical officer should be a young man, about the same age or a little bit older than the fliers, and should fly with them as often as his time permits. He must work in close co-operation with the instructors in order to gain as much information as possible about the student flier. It is his primary duty to study all medical problems in connection with flying, and I can assure you they are many, and a lot of them still remain to be solved.

I am sorry that time does not permit to go a whole lot deeper into this subject, and to go into detail of the many problems that present themselves to a medical officer engaged in this type of work. The

progress that has been made by medical officers along this line of work has been wonderful, but it must not stop. I know you gentlemen are sufficiently interested to help us to carry on this work in order to bring flying to a high degree of safety for the protection of the pilot and his passengers. The necessity for new and progressive thinking along medical lines in aviation is most forcefully brought home to every surgeon, on whom befalls the painful duty to hurry in a speed boat to the scene of an accident, and who sees the lifeless features, which were but a moment ago set in grim defiance, those limp hands that were clutching the wheel in steady control, with nerves alert, when the unexpected came. It is this picture which made me appear before this distinguished Association in order to present to them some of the problems encountered in aviation, with the view to arouse renewed interest, renewed research and new thought in this most dangerous undertaking, "The Conquest of the Air."



THE FLIGHT SURGEON—A METHOD FOR SECURING PHYSICAL EFFICIENCY¹

By MAJOR WILLIAM F. BONNER

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THE FOLLOWING were the ways by which a flier's usefulness could be ended, first, in combat with the enemy, in which it has been estimated that not 2 per cent were lost; second, estimates from all sources have proven that not 8 per cent of total disabilities due to flying have been caused by mechanical defects in the plane or engine; the remaining 90 per cent have been due to the failure of the pilot, himself. This percentage of loss that was due to the flier loomed large, as the cost of each pilot delivered overseas was \$40,000. The conservation of this valuable human material and money could only be done by providing a specially trained medical officer, who, as medical advisor to the Commanding Officer, was charged with the duty of maintaining the mental and physical fitness of the individual fliers of the command. This officer was the Flight Surgeon.

"The duties of the Flight Surgeon were essentially as follows: He had full charge of everything connected with the physical condition and care of the flier. The Flight Surgeon lived with and associated with the fliers constantly. In this way he was able to determine when any individual was not in a fit condition to fly. In order to do this, he had to be able, through tact and general efficiency, to gain the confidence of the fliers. For the same reason it has been demonstrated that the Flight Surgeon should take flying training and actually become a licensed pilot."

When I was in the Flight Surgeon's department, there were several aids in maintaining the efficiency; the Physical Director, the Branch Medical Laboratory, and the ambulance airplane. The Physical Director not only superintended the physical exercise of the fliers, under the orders from the Flight Surgeon, but also got up games and entertainments for their relaxation. The Branch Medical Laboratory rated each flier for altitude as demonstrated by the test on the rebreathing machine, which determined the lowest percentage of oxygen each aviator was capable of standing. This test was also excellent in locating latent cardiac lesions and approaching staleness. As the Flight Surgeon was required to go to every airplane wreck, where anyone was injured, so an airplane ambulance was constructed, which enabled him to reach the injured one quickly, give first aid if necessary, and then convey the

¹Read at 29th annual meeting of the Association, Boston, Mass., June 2-4, 1921.

victim immediately to the hospital. The first ambulance planes were constructed from the Curtis training planes.

The following examination was given each flier at least semiannually:

GENERAL

(Stripped to the waist)

1. Pulse:

After five minutes reclining

On standing

After standard exercise (putting foot on a chair and stepping up on chair five times in succession).

Two minutes after exercise

2. Breath held, seconds

3. Heart function

4. Blood pressure: Systolic () Diastolic () (We took before and after exercise).

5. Hemoglobin percentage

EAR

6. Test of internal ears, VIII nerves, brain-stem and cerebellum.

(a) Is nystagmus present on looking straight ahead?

(b) Turning-chair. Head tilted thirty degrees forward. Eyes closed.

(x) Nystagmus after turning to right left

(y) Pointing:

(1) Before turning: Right arm left arm

(2) After turning to right: Right arm left arm

(3) After turning to left: Right arm left arm

(z) Falling:

(1) After turning to right

(2) After turning to left

Eye.

7. Ocular movements

8. Visual acuity: Right left

9. Muscle balance: Esophoria exophoria hyperphoria

10. Near-point for accommodation (Each eye separately) R. E.

L. E.

11. Near-point for convergence

12. Prism divergence (if any heterophoria is present)

13. Pupillary reactions: Direct: Consensual: Accommodation:

(a) Right eye

(b) Left eye

The Flight Surgeon held sick-call daily, when it was the duty of every pilot, needing attention, to report. When the trouble was minor,

he was turned over to the medical officer of the day for attention. If the condition were graver, he was given the physical examination stated above and then the disposition of the case was decided upon: grounding and being put under the care of the Physical Director, hospitalization, or leave of absence. The fliers complained of every variety of physical and mental ailments. One man made poor landings; it was discovered that he had a large degree of esophoria and poor stereoscopic vision. Another flew poorly and it was found that he had an Argyll-Robertson pupillary reaction and a three plus Wassermann due to hereditary syphilis. A number had to be grounded temporarily because of acute sinusitis and otitis media. After the influenza epidemic, a number had cardio-vascular conditions; some showed signs of being fatigued easily, fainting after holding their breath for only a short time; others showed temporary vestibular disturbances. They often came for personal advice; family worries, financial cares, even about the advisability of getting married. Their mess also had to be supervised to prevent dietetic indiscretions.

Since I have left the service, there has been a change in the duties of the Flight Surgeon. After passing a rigid physical examination, he is required to study at the service school at Mineola for three months. He has been required to take over the duties of the Branch Medical Laboratory in doing the rebreathing examinations. He no longer has the Physical Director to aid him in the care of the fliers. The semi-annual examination is much more complete than that formerly given those who wished to become aviators. It includes depth perception, eye-muscle tests for near and distant, tangent-curtain diagnosis, eyes tested for color vision separately, a complete refraction done under homatropine to discover latent hypermetropia, and a very thorough examination of the nervous system. Instead of the ambulance plane that we used with only one stretcher, there is a DeHaviland 4 fitted up with two stretchers and a much more commodious Curtis Eagle plane built to carry ten persons, six sitting and four in stretchers.

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THE OCCURRENCE OF MYCOTIC INFECTIONS AMONG ARRIVING ALIENS IN RELATION TO NATIONAL PREPAREDNESS¹

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IT IS not believed that the importance of mycotic infections and their possible relation to national preparedness are realized by the vast majority of the profession in this country. As many of these infections are common in countries which furnish large numbers of immigrants, their detection is an important function in the medical examination of these future citizens. This is particularly true because of the tendency of the present immigrant to settle in crowded districts of our largest cities where the conditions are ideal for the spread of these diseases.

In the report of the Surgeon General of the Army on defects in the first two million drafted men, mycoses, not including favus and ringworm, occurred in four men accepted for full service, three for limited service, and was the cause of thirty-nine rejections. Trichophytosis, or ringworm of the scalp, beard, or body occurred in sixteen men accepted for full service, and was the cause of twenty-nine rejections. Favus was not tabulated, being classed under other diseases of the skin and cellular tissues. Favus and ringworm of the nails were not mentioned.

Figures obtained from Stelwagon² show that from 1876-80 of those examined for service in the French Army Department 1,541 had favus; from 1881-85, 1,399 had favus; and from 1887-91, 964. In Belgium from between 1888-92 there were exempted from military service owing to favus 3.03 per 1,000; and even with rigid examination of recruits it existed in the service to the extent of 0.15 per 1,000.

A report of the committee on statistics for the American Dermatological Association for the years 1878 to 1911, inclusive, gives 2,040 cases of favus, or a percentage of 0.3 of all dermatoses reported by its members. For the years 1898 to 1911, inclusive, the percentage was 0.26, while for the year 1916 it was 0.166, thus apparently showing a steady reduction in percentage. Contrasted with this, trichophytosis of the scalp, a disease already endemic in this country, shows a percentage of 1.06 from 1878 to 1911, 1.27 from 1898 to 1911, 1.59 for 1916, or a steady increase.

The various types of mycoses are the causes of a large number of

¹ Read at the 29th Annual Meeting of The Association of Military Surgeons of the United States, Boston, Mass., June 2-4, 1921.

² Stelwagon, *Diseases of the Skin*, p. 1150 and 1151.

diseases, many of which are not important from a military standpoint, as the disability caused by them is slight. Among these are thrush, affecting mucous membranes of children, tinea versicolor, a chronic skin disease easily cured, and erythrasma, a fungus infection of the skin, very similar to tinea versicolor and likewise easily cured.

Mycetoma, or madura foot, blastomycosis, actinomycosis, and sporotrichosis are all serious affections but relatively rare. Any of these diseases would cause the rejection of a recruit.

Trichophytosis and favus are the two most important mycotic diseases among arriving immigrants from the standpoint of public health and preparedness, because of their common occurrence, communicability, and chronicity. Both of these diseases attack the scalp, nails, and skin. On the skin both respond readily to the common parasiticides, and for this reason will not be further discussed. Ringworm and favus of the nails may be speedily cured by complete removal of the infected nails. From September, 1919, to May, 1921, 163 cases were treated by this method at Ellis Island. These affections of the scalp, on the other hand, are very difficult to cure and require radical treatment.

The tabulation on following page, of the nativity of 814 aliens certified at the Port of New York between 1910 and 1920 as suffering from the various types of favus and ringworm shows the main sources of these conditions among the arriving immigrants.

It is seen that four countries, Austria, Greece, Italy, and Russia, furnish the great bulk of all cases arriving, except favus, which also comes largely from Turkey. However, cases have arrived from practically every country in Europe, Asia, and Africa. The cases among Hebrews have their origin in practically every country, and show the extensive spread of these infections among this race. The relatively high percentage of tinea barbae among Italians is striking, but no explanation is known.

Considering the above tabulation, it must be remembered that the period of the World War is included, and the number and source of immigrants were greatly influenced by this. Thus from July, 1914, until the latter part of 1919, immigration from Central and northern Europe was practically non-existent.

Ringworm or tinea trichophytina of the scalp occurs chiefly in two types. As most often seen in this country, a well-developed case shows typical red, scaly patches varying greatly in size. The other shows numerous small lesions widely diffused over the entire scalp, sometimes resulting in pustules. The latter form causes a general thinning of the hair and is more difficult to detect. This disseminated type is more

NATIVITY OF 814 ALIENS CERTIFIED AT THE PORT OF NEW YORK AS SUFFERING FROM FAVUS AND RINGWORM

Disease	No. of cases	Italy			Russia			Austria			Greece			Turkey			All others			Hebrews, all nationalities		
		No.	Per cent		No.	Per cent		No.	Per cent		No.	Per cent		No.	Per cent		No.	Per cent		No.	Per cent	
Favus.....	219	72	32.73	64	29.09	15	6.82	16	7.27	40	18.18	13	5.91	66	30.1							
Ringworm of scalp.....	159	48	30.06	66	41.51	11	6.91	16	10.06	4	2.51	14	8.8	58	36.4							
Ringworm of beard.....	44	29	65.91									15	34.1									
Ringworm of nails.....	392	117	29.85	96	24	5.5	14	6.3	16.1	5.1	20	5.1	41	10.5	66	16.8						

common among arriving aliens. As this disease, with very rare exceptions, disappears spontaneously at puberty, it will not be further discussed.

Ringworm of the beard, *trichophytosis barbae*, is a very chronic infection and one which would probably cause the rejection of a recruit, or at least would require considerable time for a cure. This disease is fairly common in this country, 2,501 cases having been reported from 1878 to 1911 by the members of the American Dermatological Association. This constitutes 0.36 per cent of all dermatological cases included in the report. In 1916 this percentage dropped to 0.16.

Ringworm of the nails is a common trouble among arriving aliens. Whereas this defect in itself would not be a hindrance to service, the infected person would be a latent source of ringworm of the beard and of the skin.

Favus of the scalp is a parasitic disease occurring in man, and many animals, such as cats, mice, dogs, and rabbits. It is relatively uncommon in this country and it is stated that it is not seen except among the foreign born. It is commonest among the poorer Jews from Russia, Poland, Hungary, Galicia, and the East, and among the same class of Mohammedans in Turkey, Asia Minor, Syria, Egypt, and Algiers. It is not rare, however, in the southern parts of France, some parts of Italy, and in Scotland, and there is an endemic focus in Ireland.

Favus was the first disease in which a fungus was attributed as the causative agent, having been discovered by J. L. Schonlein in 1839. This fungus, the *achorion schonleinii*, was named after its discoverer. In addition to the above Sabouraud³ describes four additional types occurring in animals. According to this authority these only rarely attack man and never affect the scalp. Animals may contract the disease from man and thus be a source of infection. Microscopical examination of this fungus shows the mycelial threads to be wavy and varying in length and thickness. Its spores also vary in size and shape. It grows fairly well on acid media which inhibit bacterial growth but allow the fungus to develop. Room temperature is satisfactory.

The number of aliens examined at the Port of New York and the number of cases of favus found and detected during the last twenty fiscal years are shown in the following table. As will be seen, the number of cases were greatly reduced during the period of the war.

³ Sabouraud, *Les Teignes*, p. 179.

NUMBER OF CASES OF FAVUS DETECTED AND NUMBER OF ALIENS EXAMINED AT THE PORT OF NEW YORK DURING THE FISCAL YEARS 1901 TO 1920, INCLUSIVE.

<i>Year</i>	<i>Favus</i>	<i>Number of Aliens Inspected</i>
1901	52	153,196
1902	65	565,983
1903	43	689,356
1904	28	633,811
1905	51	821,103
1906	62	837,060
1907	61	977,008
1908	65	689,174
1909	67	733,267
1910	84	912,026
1911	68	749,642
1912	35	726,040
1913	41	1,044,157
1914	69	1,009,854
1915	20	242,722
1916	6	174,461
1917	2	160,105
1918	1	55,191
1919	16	333,727
1920 (10 mos.)	104	568,922

There has been a marked increase in the percentage of mycotic diseases among arriving aliens during the last fiscal year. From July 1, 1920, to May 1, 1921, there were 104 cases of Favus and 314 cases of ringworm of scalp, beard, and nails detected among 568,922 aliens. This is at the rate of 7.95 cases per thousand as compared with 2.98 cases per thousand in 1914, the last year of normal immigration. It is believed that this is attributable to the character of immigrants arriving within this period and the conditions under which they had lived prior to embarkation.

No disease, with the possible exception of trachoma, has been more carefully searched for nor over a longer period than favus. Under the immigration law it is mandatorily excludable. In consequence, many cases have been deported and many deterred from coming.

A typical untreated case of favus shows the characteristic favus cup or scutulum. This is yellowish, cup-shaped, about the size of a split pea, with a lusterless hair projecting in the center. These cups often become crusted over and confluent, the typical lesions only being found at the edge of the scab. The disease is supposed to have a typical "mousey" odor. Among arriving aliens this is rare, as the immigrant knows that he must undergo a medical examination and systematically removes all possible signs of disease.

Favus is a very chronic disease, and unlike ringworm does not disappear at puberty, but may last a lifetime. It heals with scarring and thus causes permanent baldness. The type of case seen most frequently at Ellis Island shows bald scarred areas of variable size with reddened spots, the healed areas containing few very coarse, wiry hairs. Often the active areas are covered with yellow crusts, which on removal reveals a reddened moist base. It is more common among children, though found at all ages. Many aliens present extensive bald areas containing a few very coarse hairs, the result of healed favus.

At the port of New York during the primary medical inspection the scalp and nails of all aliens are carefully examined for evidence of mycotic infections. If any suspicious lesions are found the alien is held for a laboratory examination. This is made by soaking hairs, with intact roots, epilated from suspicious areas, or small pieces of nails, in 40 per cent potassium hydroxide for three hours or longer. The longer the specimen is allowed to soften the easier it becomes to find the mycelium or spores. The specimen is then mashed beneath a cover glass and examined microscopically. If a negative report is made on a scalp with suspicious lesions a sweat cap is applied to the patient's scalp. This consists of some impervious material such as rubber tissue placed directly on the hair with its edges held to the scalp with a band of adhesive which extends one-half inch on the rubber tissue and one-half inch on the scalp. Several layers of gauze are placed over this and the cap kept on from three to seven days. This causes profuse sweating and any active areas of favus become reddened, often with the formation of yellow crusts. The patient is then reexamined microscopically.

While under the immigration laws favus is a mandatorily deportable disease, under certain circumstances permission may be given by the Secretary of Labor for its treatment. Practically every method of treatment ever recommended has been tried in the hospital at Ellis Island, including epilation by hand followed by the application of various parasiticides, usually in the form of ointments. This method required many months or even years to effect a cure, and was most disappointing. All methods have finally been discarded except epilation by means of Roentgen rays.

The patient is prepared by a close clipping of the hair, no irritating ointments of any kind having been applied for at least one month previously. The scalp is divided into five areas by the Kienbock-Adamson method, taking a point midway between the anterior and posterior hair lines and locating four additional points 5 inches from the first and five inches from one another. In some cases, with large or small craniums, this cannot be done. An eight-inch skin to target distance

is used without a filter, the target being placed perpendicular to the point treated.

An epilating dose is given, figuring from the method described by Witherbee and Remer⁴. The non-hairy portion is protected by lead foil and the entire scalp is treated at one sitting. The Roentgen rays simply cause epilation and have no destructive effect on the fungus organisms.

Following the treatment the scalp is kept greased with vaseline and a light cap of gauze applied to prevent spreading of the diseased hairs through the wards. The hairs begin to loosen in about two weeks and epilation is usually complete in one month.

Epilation is assisted by applying strips of adhesive, letting them remain for a few minutes, and then removing. When epilation begins, two per cent ammoniated mercury ointment is applied, and this is gradually increased to five per cent. The hair begins to return in from ten to twelve weeks and at the end of three months there is usually a good return of fine, short hairs.

The electric power in the hospital is generated on the island and there is a marked main line fluctuation. Due to this it is very difficult to control absolutely accurate dosage, with the result that epilation has not always been complete in our cases. If a fair amount of epilation is obtained the results are usually good.

The criteria on which to base a cure of favus are most important as it means the landing of the immigrant. Sabouraud states:⁵

After several negative microscopic examinations, and when the redness at the site of the old lesions has disappeared, a case of favus can be regarded as cured, but on condition that we continue to keep it under surveillance and on condition that the patient presents himself to the physician whenever he sees any abnormality whatsoever appear at the site of the old lesion.

The authorities in this country agree that the patient should be kept under observation for several weeks or months after the return of the hair, during which time numerous microscopical examinations are made. In our cases the following procedures are followed:

After the hair has returned sweat caps are applied, after which microscopical examinations are made. Three sweat caps with subsequent negative microscopic examinations are necessary before stating that a cure has occurred. In our opinion the sweat caps are very necessary before stating that a cure has been obtained, as in most of our failures the scalp appeared healthy on ordinary inspection, whereas the use of the sweat cap resulted in the formation of typical reddened areas.

⁴ Witherbee and Remer, A Practical Method of Roentgen Ray Dosage without the aid of a Radiometer. *Archives of Dermatology and Syphilology* 38: 558 (May), 1920.

⁵ Sabouraud, *Les Teignes*, p. 750.

Often these did not appear until after the application of the second or third sweat cap.

In certain cases where the X-ray failed to effect a cure it greatly reduced the areas involved, often leaving one or two small spots which on careful manual epilation and application of a parasiticide, such as iodine ointment, disappeared.

In our experience no untoward results have appeared. A transient erythema for one or two days has been occasionally noted but this always promptly disappeared. The hair has always returned with very little if any change in color or character. Without our knowledge one

Disease	Extent of epilation	Cases	Dosage	Result of Roentgen Ray treatment		Failures
				Cures	Areas greatly reduced; cured by manual epilation	
Favus.....	Good	38	All given epilating dose	32	4	2
	Fair	14	All given epilating dose	4	3	7
	Poor	4	All given epilating dose.	0	1	3
	Total.....	56		36	8	12
Ringworm	Good	24	All given epilating dose.	24		
	Fair	5	All given epilating dose.	1	1	3
	Poor	1	All given epilating dose.			1
	Total	30		25	1	4

case had been previously X-rayed in Europe three months prior to our treatment, but the hair returned perfectly.

Between July 1, 1920, and May 15, 1921, a total of 136 cases of ringworm and favus of the scalp were treated as above described. The summarized table on the preceding page contains data bearing on these treatments.

In addition to the cases tabulated there remain in the hospital 36 cases of ringworm and 14 cases of favus which have been treated but have not been under observation long enough to decide whether a cure has been obtained.

It is advisable to avoid the use of X-rays on scalps which have previously been exposed within a period of 6 months. In cases of failure of treatment a period of 6 months must likewise elapse before a second application of X-rays is made. Other methods of treatments are in our opinion futile.

Under the laws governing immigration the following mycotic diseases are classed as being loathsome and contagious and are made mandatorily deportable: blastomycosis, actinomycosis, mycetoma, favus of scalp and nails, ringworm of scalp, beard, and nails. Also, if in the judgment of the examining officer the disease could have been detected before debarkation by a competent medical examination, a special certificate is made by which the carrying steamship line is liable to a \$200.00 fine. These special certificates are made whenever possible and as a result most of the larger companies have a force of physicians who examine applicants for passage. For this reason most of the easily detected of the mycotic diseases are prevented from taking passage.

The measures taken for the detection of favus and ringworm of the scalp have undoubtedly greatly reduced the number of cases that would have otherwise entered the country. Since these diseases are known to spread slowly it is believed these long, continued precautions have had a bearing on the decrease of the disease which fact is brought out by the statistical data collected from year to year by the American Dermatological Association.



RECENT PREVALENCE OF INFLUENZA AND ITS PREVENTIVE INOCULATION IN THE JAPANESE NAVY¹

By Surg. Commr. YASUZAEMON HORI

Medical Corps, Imperial Japanese Navy

I. THE STATE OF EPIDEMICS

THE world-wide pandemic of influenza in the recent years made its first appearance in the Japanese Navy in March, 1918, and since then the disease has been recurring at varying intervals. The epidemics were most prevalent during the four periods as shown in the following table.

TABLE I.

Epidemics	Case rate per 1,000 of the average strength	Death-rate	
		per 1,000 of the average strength	per 1,000 of the case incidence
1st epidemic: April-July, 1918.	198.72		
2d epidemic: October, 1918- January, 1919	72.52	2.36	32.58
3d epidemic: December, 1919- February, 1920	61.48	3.06	49.85
4th epidemic: November, 1920- February, 1921	41.37	0.07	1.73

The figures in the above table, strictly speaking, are not comparable, as the seasons and duration of epidemics differ from each other, but so far they show that morbidity diminished in later epidemics and mortality reached its highest level in the 3d epidemic and diminished thereafter.

II. THE PREVENTIVE INOCULATION

In carrying out the prophylactic inoculation against influenza we started from the standpoint that the primary cause of the disease was yet unknown, that in Japan the pathogenic organisms isolated from sputum, nasal and pharyngeal discharges of the patients, and from blood and visceral organs at autopsy, were chiefly the Pfeiffer's bacillus

¹Read at 29th Annual Meeting of The Association of Military Surgeons, U. S., Boston, Mass., June 24, 1921.

and pneumococcus, and that the vaccine, consequently, should have the property of confronting these complicating agents. The vaccine, therefore, was composed of *B. influenzae* and pneumococci. As the reaction following inoculation of this vaccine was found to be very slight, the concentration of the vaccine was gradually increased, one cubic centimetre of the vaccine containing 0.2 mg. each of the Pfeiffer's bacillus and pneumococci till April, 1920, 0.3 mg. from May to the middle of October of the same year, and 0.5 mg. thence forth. The vaccine was generally inoculated twice, 0.5 c.cm. for the first injection and 1.0 c.cm. for the second, but if thought necessary a third injection of 1.5 c.cm. could be given. The inoculation was carried out extensively in the Navy after December, 1919, and since November, 1920, hardly any one in the navy was left uninoculated.

III. THE EFFECT OF THE INOCULATION

Statistical returns on the effect of the prophylactic inoculation, prepared according to a fixed formula laid down in May, 1920, were collected from all parts of the Navy, and from these materials the statistics concerning the third epidemic were selected and put into examination for studying the effect of the inoculation upon the morbidity and mortality from influenza among the force afloat, where men lived such a crowded life as nowhere seen on land.

TABLE 2.

	A	B	C	D
Duration of the epidemics	Dec. 1, 1919- Feb. 7, 1920	Nov. 24, 1919- Jan. 26, 1920.	Dec. 9, 1919- March 23, 1920.	Dec. 5, 1919- March 11, 1920.
{ shortest	8 0 days	9 0 days	4 0 days	19 0 days
{ longest	57 0 days.	50 0 days.	78 0 days	71 0 days.
{ average	32 6 days.	30 6 days.	30 0 days.	45 5 days.
Case rate, per 100 of the average strength	9 42	6 84	15 09	8 04
Number of cases with pneumonia	52 0	95 0	119 0	73 0
Pneumonia rate, per 100 of the patients	9 77	18 96	15 92	11 91
Other complication rate, per 100 of the patients . . . . .	.....	.....	1 39	0 65
Death rate, per 100 of the patients	0 18	0 16	0 94	0 15
Persons once inoculated	1 88	2 40	6 20	2 79
Persons twice inoculated . . . . .	.....	.....	6,159	6,206
Persons not inoculated . . . . .	.....	.....	5,799	6,165
Persons unknown whether inoculated or not . . . . .	.....	.....	160	1,017
			3	91

Remarks:

- A. Group of ships where inoculation was not carried out.
 B. Group of ships where inoculation began toward or after the end of the epidemics.
 C. Group of ships where inoculation began a week before or after the outbreak of the epidemics.
 D. Group of ships where inoculation began eight days or more after the outbreak of the epidemics and was completed before the end of the latter.

As shown above, the incidence rate is the highest in the Group C¹, and declines in the order of A, C², and B, viz., the result is the worst in those inoculated at about the same time with the outbreak of the epidemics (pneumonia rate in B excepted).

The relation of the inoculation and the previous history of influenza with the morbidity and mortality from it in the total number of cases in Groups A, B, C¹, and C², and in several other ships is shown in the following table.

TABLE 3.

	Case incidence.	Case with Pneumonia
Total number of cases.	2,643	391
(a) Cases with history of the previous attack of influenza...	254(9.6%)	rate, per 100 of the 103 cases under (a) = 40.55
(b) Cases with history of the preventive inoculation	588(22.2%)	rate, per 100 of the 68 cases under (b) = 11.56
(c) Cases with history of both the preventive inoculation and the previous attack of influenza ..	29(1.1%)	rate, per 100 of the 0 cases under (c) = 0
(d) Cases unknown as to its previous history.....	631(23.9%)	rate, per 100 of the 40 cases under (d) = 6.34
(e) Cases not belonging to those under (a), (b), (c) and (d) ..	1,141(43.2%)	rate, per 100 of the 180 cases under (e) = 15.78

REMARKS

By "the history of the preventive inoculation and the previous attack of influenza" in this table, it is meant that the patients referred to were inoculated or passed through an attack of influenza all before November, 1919.

The above table shows that those who had neither the preventive inoculation nor the preceding attack of the disease nor both of them are most susceptible to the disease, and that the susceptibility to pneumonia is the highest among those who had the preceding attack of influenza. From the statistical point of view, therefore, it seems to be clear that the preceding attack of influenza confers some protection against the disease, and that it does not produce any immunity against the complication of pneumonia. The state of epidemics of influenza in the force afloat where the inoculation was completed beforehand is shown on next page.

TABLE 4.

	Group 1.	Group 2.	Group 3.
Periods of the epidemics,	Dec. 27, 1919– Feb. 25, 1920.	Feb. 23– March 7, 1920.	April 4– June 22, 1920.
Duration of the epidemics in days	61	14	Shortest . . . 3 0 Longest . . . 24 0 Average . . . 12 5
Interval between the preven- tive inoculation and the out- break of the epidemics in days.	6	34	Shortest . . . 67 0 Longest . . . 151 0 Average . . . 124 0
Incidence rate, per 100 of the average strength.	8 41	9 73	15 81
Pneumonia rate, per 100 of case incidence.	33 33	.....	.....
Death { per 100 of average rate { strength.	0 31	.....	.....
per 100 of cases.	3 70	.....	.....
Persons once inoculated.	349	231	1,278
Persons twice inoculated.	349	231	1,274
Persons not inoculated.	0	24	9
Cases among not inoculated. . . .	0	0	9
Case rate, per 100 of non- inoculated.	0	0	100 00
Persons with history of previ- ous attack of influenza.	0	0	4
Cases among inoculated.	27	25	194
Attacked after 2d inoculation. . .	27	25	194
Rate, per 100 of the twice in- oculated.	7 74	10 82	15 18
Death among twice inoculated. . .	1	.....	.....

The figures in the above table are much too small to warrant any definite conclusion, and as the season of the epidemic of the Group 3 differs from that of the Group 1 or 2, the figures are not comparable. But they show that in the ships where the preventive inoculation was completed some time before, the epidemic could break out and even develop as extensively as in ships non-inoculated. And it is noteworthy that none of the cases of the Group 2 and 3 developed pneumonia.

From the facts above stated, the following conclusions were arrived at:

1. The efficacy of the preventive inoculation against influenza is not yet established.

2. The preventive inoculation carried out near the outbreak of the epidemic may bring untoward result.

3. In places where the preventive inoculation is completed, the epidemic of influenza can sometimes occur.

4. In case of the preceding paragraph the epidemic can assume the character of the epidemics in places not inoculated.

Materials dealt with in this paper are restricted solely to the force

afloat, and the above conclusions might not be applied to the whole Navy.

As to the results of the preventive inoculation since the epidemics dealt with above there is not sufficient materials available. Broadly speaking, however, it can be said that they endorse the fact stated in the first, the third and the fourth paragraphs of the conclusions.

The experience heretofore in the Navy concerning the prophylactic inoculation against influenza does not positively demonstrate its efficacy, but the theoretical ground for it has undergone no change, and possibility of actively immunizing animals against Pfeiffer's bacillus and pneumococci was also proved in the laboratory of the Naval Medical College, as in many other places. In view of these facts and the slight reaction of the inoculation, the authority concerned does not yet think it appropriate to give up this preventive measure and the subject was discussed in the annual meeting of the surgeons in chief of all the Admiralty ports and squadrons, and the line to be followed in the future was agreed upon as follows:

IV. THE FUTURE LINE

1. The dose of Pfeiffer's bacillus and pneumococci is to be increased to 0.5 mg. each for the first injection,

1.0 mg. each for the second injection,
and if thought necessary third injection of 1.5 mg. each may be given.

2. The inoculation is to be carried out

(a) for the volunteer to enlist next June, immediately after their enlistment into the Navy (for the recruits thereafter the decision awaits further investigations).

(b) both for the remaining men of the Navy and civilians in the naval employment, once yearly in November.



OPENING ADDRESS DELIVERED TO THE FIRST CLASS
AT THE MEDICAL FIELD SERVICE SCHOOL,
CARLISLE BARRACKS, PA., JUNE 1, 1921

BY COLONEL P. M. ASHBURN
Medical Corps, United States Army
Commandant

GENTLEMEN: To you, who will constitute the first class of officers to go out from this school, hail and welcome!

I am glad to greet you as new members of the Medical Corps of the Army, and as doctors who have, I believe, chosen wisely, and officers who, I trust, will do the service credit. You come to us on a status different from that which your successors will have. They will come as reserve men who are to demonstrate to our satisfaction that they are of the proper stuff and that they will make good officers. You come as men already accepted as members of the Medical Corps, to remain such until your own desire, death, disability, age, or misconduct forces a separation. You are, therefore, not to be merely dropped in case you do not make good; you can still remain officers, and, if you are not the kind which we hope you are, you will lack an incentive to work which subsequent classes will have. But we have generally good accounts of you from the Army Medical School, and we believe that you are of the type which will make good for the sake of making good and because you have the opportunity. We believe that because many of you have had previous opportunities in previous service and because you did make good to a sufficient extent to obtain the commendation of your superiors. All of you who had war service are to be congratulated, for you had a schooling more real, more important than we can give you here. Some of you may even have had experiences which your teachers will envy. You may have something to give us. If so, we want it, and we hope to use you in teaching your fellows. Bear in mind that this is a new school, that it has not yet had the shaking down which comes from practice and experience, that our schedules are yet untried and subject to revision, that with your class the course must be shortened and condensed, that the equipment is not complete, and that we are not yet what we hope to become.

Your class must take the shortened course for the reason that we are to get in the new class on August first, and we have not the room, the material, or the personnel for running two basic courses simultaneously, in addition to our other work. So you see that you are under the obligation to get in six weeks as much as possible of the matter

which subsequent classes will get in seventeen weeks. If I know, that means work.

This work will be, for the most part, on non-medical subjects, some of which are apt to be profoundly uninteresting to a man whose heart is all in being a doctor. But they are essential if he is to be able to use his medical knowledge to the best advantage in the Army. Do not misunderstand me. The Army's greatest asset in a medical officer is the fact that he is a doctor—is his professional education and ability. The function of this school is to fit this fine and important item into the military machine, to make the doctor a functioning member of the great team which constitutes the Army, and if we fail to make that adjustment we fail as a school. Officers new to the service and people outside of it are apt to find administration, paper work, red tape as it is called, aggravating, hampering, and useless. But it is all the product of experience, and as experience grows methods change. And those things are not peculiar to the Army. Had you remained in civil life you would still have had other things to do than ministering to the sick. You would still have had to keep accounts, to render reports of duties done, to appear before courts to testify, to manage hospitals, diagnose and treat, or have treated, the ills of automobiles, to advise change of climate or hospitalization for sick people, to be administrators or custodians of property at times, to be good citizens, gentlemen, and your brothers' keepers. You would have grown into all these things gradually, and could fill your places in the body politic with never a thought of red tape unless you were elected to office or haled to court and had to deal with an unusual shade of it. But in the Army, which is a great communism, a great oligarchy, a great autocracy or bureaucracy, as you happen to view it, the tape is all of a hue unusual to you and it appears bulky, burdensome, and confusing for a time. But it is nearly all protective, protective to you, to the Government, or to the soldier. And when you either exercise or are subjected to authority, supervision, or responsibility you need protection. So it will be well worth your while to work to get familiar with the subjects taught here. We hope that we may be able to show you your relation to the big machine, how you may so fit in as to promote its smooth working, and to cause you to realize that as a member of a team you can accomplish more than as an individual. Doing head surgery is much more interesting work after a battle than being an evacuating officer of wounded, and it may even bring more glory, yet it may well be that the evacuating officer saves more lives and renders service more valuable to the Army and the Nation.

I assume that you are all possessed by the desire for service. Other-

wise why should you have become doctors in the first place and officers in the second? Cling fast to that desire, do not become vainglorious, do not let yourselves come to believe that service is unworthy of you or not fitting for one of your dignity and rank. When you reach that point you have forsaken your greatest usefulness, and you are well on the way to forsake happiness, contentment, and respect, and as these are among your most precious possessions, without which life is but a husk, you can by no means afford to forsake them.

From time to time, doubtless for the purpose of helping us when discouraged, some medical writer quotes one of Robert Louis Stevenson's tributes to medical men, and they are all so fine that it usually helps. One which we can helpfully bear in mind is as follows: "There are men and classes of men who stand above the common herd: the soldier, the sailor, and the shepherd not infrequently; the artist rarely; more rarely still the clergyman; the physician almost as a rule. He is the flower (such as it is) of our civilization; and when that stage of man is done with and only to be marvelled at in history, he will be thought to have shared as little as any in the defects of the period, and most notably exhibited the virtues of the race. Generosity he has, such as is possible to those who practice an art, never to those who drive a trade; discretion, tested by a hundred secrets; tact, tried in a thousand embarrassments; and what are more important, Heraclean cheerfulness and courage." What a tribute, if true! And I know that there are doctors of whom it is true. I take great pride and comfort from the fact that it was true of my father and my grandfather. I trust that it is true of all of you. Note that in Stevenson's designation of outstanding classes he names first soldiers, and praises most physicians. Note also that it is your proud privilege to be both soldier and physician, and that it is, therefore, doubly to be expected of you to be men who stand above the common herd, who lead and stand for examples while you serve. Keep this obligation before you always and so do your daily work as to honor the terms soldier, officer, gentleman, and doctor. Keep in mind also the fact that your first obligation to the service and to yourselves is to do with your might the thing which is before you, the day's duties. Then, and then only, have you the right to dream of greatness and greater things than those you are doing. I have known brilliant medical officers who were relative failures because, in their absorption in what interested them as larger things, they neglected the prescribed and necessary routine duties. After the performance of your routine and daily duties, there are no limits, except those imposed by time, substance, your social obligations, and your own capacities, to what you may accomplish. Dream and plan them, and work to make your dreams and plans

come true. I have referred to your social obligations, but I use the term in its broader sense, as referring to your obligations to your wife, your family, and your neighbor, not to your obligations to make certain calls, to give a certain dinner, to live on a certain scale. These latter things have their importance, and you may hear more of them while you are here. They will not greatly interfere with your growth in accomplishment and in worldly greatness, in fact they may greatly promote both.

But do not get the notion that they are more important than they are or that they can really make for greatness. As army officers you have elected a calling which provides modest competency but not material wealth. If you are to be honest and to be respected by yourselves and others you must live what was a few years ago much discussed as the simple life. You must live within your incomes, and not spend more or entertain more or live more lavishly than your income justifies. To do otherwise is pretense, snobbery, and a species of dishonesty, and, in my opinion at least, not conduct becoming an officer and a gentleman. And in doing so you would be missing the finer and better things of life, the satisfaction of duty well done, of good accomplished, of self respect, and the esteem of your equals and superiors, and the solid joys of a contented and happy home. And from your current income it is your duty and your high moral obligation to put aside each month a sum at least sufficient to provide for a decent amount of life insurance and for the present or future education of your children, for it is not seemly and not creditable to the service that an officer's widow should be left in penury or that his children should grow up in ignorance.

Bacon, in his essay on "Marriage and Single Life" has said that, "He that hath wife and children hath given hostages to fortune: for they are impediments to great enterprises, either of virtue or mischief." But when hostages are given or demanded they are for benefits granted in return, and they are always things highly valued; so do not think it is not worth while to have wife and children. They are the best possessions any man can have, the greatest blessings, the greatest helps; such rich possessions that many times Dame Fortune's own hard heart recognizes their value as greater than the pawn for which she accepted them and grants greatness in addition to happiness, because of them.

I think it worth while for you to get families. "But with all thy getting, get wisdom."

When the establishment of this school was under consideration, I was discussing one day with General McCaw the subject of the need for it and its probable relationship to the Army Medical School, and he

asked me how we could lead or teach young officers to become wise and learned humanists, broadly cultured gentlemen, and such ornaments to the corps as were formerly Colonel Dallas Bache and Colonel Woodhull, and, I may add, such as General McCaw now is. William Ellery Channing in his "Essay on Self Culture" says, "Intellectual culture consists not chiefly, as many are apt to think, in accumulating information, though this is important, but in building up a force of thought which may be turned at will on any subject on which we may be called to pass judgment. This force is manifested in the concentration of the attention, in accurate, penetrating observation, in diving beneath the effect to the cause, in detecting the more subtle differences and resemblances of things, in reading the future in the present, and especially in rising from particular facts to general laws or universal truths." Nevertheless, I must confess that I do not know the answer to General McCaw's question, any more than I know how to teach or lead you to become Thomas Edisons or William Mayos or Merritte Irelands. I can tell you that hard work and devotion to the job were big factors in the successes of these men, but that does not tell the whole story. As Saint Paul said of the early Christians, there is diversity of gifts, gifts of wisdom, of knowledge, of faith, of healing, of miracles, of tongues. "But covet earnestly the best gifts: and yet shew I unto you a more excellent way." And then follows the wonderful thirteenth chapter of Corinthians, which I advise you all to reread, because as doctors and officers you will need its teaching.

Again, I am glad that you are here. I hope that by your interest, your efforts, and your work you will help us to make this first session of our school so great a success that all future sessions will have to be good indeed to equal it. I hope that you may make good here as you made good in war and since, and I hope that each of you may prove such an ornament to his corps as to make his corps an ornament as well as a most useful part of the Army, a reliable and trustworthy agency for the great work of a great country.



MEDICAL ADMINISTRATION OF THE INTERMEDIATE SECTION, FRANCE¹

BY LIEUT. COLONEL E. L. RUFFNER, M. C.

Medical Corps, U. S. Army.

UNDER our regulations the various zones or regions covered by our Army in time of peace or war are from the front to the rear, zone of combat, or zone of the Army; advance section; intermediate section; base sections.

In France our Army operated under these regulations, the various sections, except that of the zone of the Army, being designated in orders.

The medical administration of the various sections would naturally vary, with the different problems to be met, different kinds of activities of the troops contained within them; as, for example, advance section, busy with delousing; intermediate section, with the leave areas; base sections, with large construction; many of the activities being identical.

General Orders No. 20, Hdq., A. E. F., Aug. 13, 1917, defined the Intermediate Section to include the zone between Base Sections 1 and 2 and the French Zone des Armies, bounded on the north by the line Neuville-Marcilly-le Hayes, on the south by the line from Guret to the junction of the French Zone des Armies and the Swiss frontier. This, roughly speaking, included all territory south of line Le-Mans-Paris, French Alps to Nice, to Marseilles, to Limoges, back to Le-Mans, comprising at this time about 43 French Departments, or about three-fifths of France, and its activities were varied and important.

Later Paris, Tours, and Le-Mans were made separate commands. Base 6 was established at Marseilles with 13 departments from the Intermediate Section; Base 2, Bordeaux, was enlarged by 5 departments from the Section.

The final territorial change of sections was announced in General Orders No. 25, S. O. S., A. E. F., June 28, 1918, and consisted of Base 1, 5 Departments; Base 2, 14; Base 3, England; Base 4, 3 Departments; Base 5, 4 Departments; Base 6, 13 Departments; Base 7, 1 Department; Advance Section, 15 Departments; Intermediate Section, 25 Departments.

Headquarters of the Section was at Nevers Nièvre, on the Loire River, about 156 miles slightly southeast on the P. L. M. R. R. It was also on the American main line of railroad communication between our base at St. Nazaire and our front.

¹ Read at the 29th Annual Meeting of the Association of Military Surgeons of the United States, Boston, Mass., June 2-4, 1921.

At this point was the Commanding General and his Staff, and not far away in every direction were his main large activities: the General Intermediate Storehouse Depots at Gievres and Montierchaune, each capable of storage for two million troops; ordnance plant at Mehun; automobile repair at Vernuil, etc.

Circular 17, Hdq. L. O. C., A. E. F., January 17, 1918, established the Section Surgeon of the Intermediate Section. The paragraph covering the duties of a Section Surgeon was brief. Great latitude was given them to work out their own problems, and during the entire period of the War every assistance was invariable given me. When requests were made for personnel, they were always filled as completely as circumstances would permit. The original circular held during the entire War, and the authority there given was never curtailed. With this spirit of assistance from higher authority, you could only put forth the very best that was in you to "carry on."

The organization of an office force was made upon the same line as that in the office of the Surgeon General, U. S. Army, or a Department Surgeon in the United States, having a section for each branch to be covered, with an executive officer to coordinate the whole.

The French Government detailed a French Medical Officer (a Major) as Liaison Officer. He had his desk in my office, and all matters pertaining to the Service de Sante were referred to him, and his decision was final and carried out.

He was a practicing surgeon of Vichy, a fellow of the Royal College of Surgeons, England, spoke English perfectly, and was of the greatest assistance in our contact with our Allies.

The Chief Surgeon of the Intermediate Section was nominated by our Government as Medical Liaison Officer for the 8th Region French, for the American Forces, thus being able to officially cooperate with the French General in Command of that Region.

On duty in the office were Executive Officer; Chief Sanitary Inspector, with three assistants; Supervising Dental Surgeon; Food and Nutritional Officer; Chief Medical and Surgical Consultants; Officer in Charge of Personnel; Officer in Charge of Transportation and Medical Supplies.

The types of activities in the Section were very varied; flying fields at Issoudun, Aulnat, Romorantin; large supply depots at Gievres and Montierchaune; ordnance repair shops; automobile repair shops; railroad shops; remount depots; innumerable forestry battalions; signal companies; road repair detachments; leave areas in the Dauphine, Savoie, Chamonix and La Bourboule Areas; salvage repair shops; railroad engineers operating the railroads; training schools for officers and enlisted

men; casual companies of Signal and Quartermaster Corps; care of personnel building hospital centers and working upon new railroad construction; civilian employees, being Indo-Chinese, Spanish, French, Portuguese, Italian troops; English W. A. A. C. at Central Records offices; the procurement of buildings for the hospitalization of our troops; the meeting of divisions entering the Section, and trying to instruct and assist the medical officers where to hospitalize their troops, procure transportation and supplies; furnishing personnel for the numerous Camp Hospitals as required; supplying them with equipment and transportation; inspections to see that they are functioning efficiently; medical care, German Officer prisoners; equipping hospital trains; and care of American students at French Universities.

At first the great problem that always had to be met, was that of the care of our contagious cases. The French authorities permitted these cases to be put in their own Contagious Hospitals, where they were given excellent care. Later we were able to care for them.

Just a little further description of some of the Army activities within the Intermediate Section, S. O. S.

Everything possible was grouped as near our main line of railroad communication, from St. Nazaire through Tours, Bourges, Nevers, Dijon, Is-surtille, and to our own sector of the front.

Engineer activities consisted in the forestry operations by the 20th Engineers in the provinces of Mayenne, Sarthe, Loire et Cher, Indre, Cher, Haute Savoie, Nievre, Loiret, Cantal, Allier. These battalions had to build their own sawmills, install their own machinery from the United States, and produce lumber for railroad ties to all lumber for building construction for Camps and Hospitals. One interesting thing noticed about these troops was that the Army ration needed an increase for this work.

Railroad construction consisting in a short cut from Saincaise across the Loire River to Sermeise, upon a new bridge cutting out the town of Nevers, and shortening the time for freight traffic by about 48 hours. Italian troops were among those used on this work.

Reconstruction and repairs of both American and French cars and locomotives at the large and perfectly equipped shops at Nevers.

The operation of our own trains upon this line of road.

The building of Hospital Centers and all cantonments used by our troops.

Ordnance activities.

The building, installation of machinery from the United States, and operation of the large plant at Melun.

Automobile repairs.

Construction, installation and operation of the large plant at Vermil.
Quartermaster activities.

The large Intermediate Storage Depot at Gievres, with capacity for storage for two million men, and a duplicate about one-fourth completed at Montierchaune.

Bakery at Nevers; Salvage plants at St. Pierre de Corps, Lyons, and Macon.

Replacement and Casual Camp at Chateau de Loire.

Flying Fields and training centers at Issoudun, Romorantin, and Aulnay.

Service Schools and Training Centers:

At Autun for Military Police; Officers' school at Clamecy; Automobile training school at Decise; Field Artillery School at Clermont and Montmorillon; Provisional Officers' school at le Valdaon.

Station for manufacture of toxic gas at Pont de Clay.

Replacement Divisions at St. Amand, St. Florent and Pouilly.

Signal Corps replacement Depot at Cour Cheverny; Remount Depot at Sougy.

Within this section were the large Hospital Centers of Mars, Mesves, Allerey, while Baune was supplied from it. These were of 20 base hospitals with convalescent camps.

Vichy Center where all the hotels except two of that famous watering place were used as hospitals. Center at Clermont-Ferrand.

Base Hospitals were found at Potiers, Orleans, Blois, Pruniers, Montoir, and Chateaux, and 26 Camp Hospitals scattered around the Section.

Leave Areas with stations at Chaminix, St. Gervais, Annecy, Aix-le-Bains, Chambéry, Grenoble and La Bourboule.

American Students attending the Universities at Potiers, Clermont-Ferrand, Lyons and Grenoble.

The Central Records Office at Bourges, where all the A. E. F. records were sent.

These activities are gone into in some detail, as it is felt that the work done in this section may not be known to those serving in other parts of France, and even to some on duty in the Section itself.

The Policy adopted by the Chief Surgeon, A. E. F., of having Camp Hospitals with permanent personnel, and transportation, having all patients from any organization near them evacuated to them, was the efficient solution of the care of the sick, for troops in the Section, whether permanent or in transit. Base Hospitals were used when necessary but the Section with its Camp Hospitals was able to care for the great majority of its sick, thus leaving the Base Hospitals and Hospital Centers

to care for troops evacuated to them from the front, which was their primary function.

A Camp Hospital was of 100 beds or more, and were established to care for permanent troops at a Camp or Station. It was capable of expansion. In fact none in the Section were less than 200 beds, and one at Gievres was 1,200 beds. Many of them occupied buildings from the French, without sanitary equipment as we know it. This required much building on our part. In October, 1918, there were 28 Camp Hospitals in the Section. During this month there were an average of 8,845 new cases on sick report each week. It was early recognized that one very essential feature in this type of hospital was that patients should receive the benefit of the best surgical and medical care. They were entitled to this as well as the more fortunate patient entering a Base Hospital with its corps of specialists, and modern equipment.

The personnel for these hospitals were chosen from men available at the time. Special training could not be considered at first either among the Medical Officers or men.

In November Chief Surgical and Medical Consultants were appointed. Their duty was to visit the Camp Hospitals assigned them regularly. See all the patients, institute any change of treatment necessary; assist in any difficult cases; report as to the efficiency of the Staff; any change in duties thought best, or replacement of any of the Medical Officers if called for. Five were appointed for the Intermediate Section. They were all men of high standing in the profession in this country, and this duty was in addition to that in the Base or Hospital Center to which attached. It was a great step in efficiency in this type of hospitalization.

The sanitary problem of such a large territory, with such varied activities, from little forestry detachments, the Indo-Chinese with his aversion to any sanitation, and his own peculiar diseases, to the immense Supply Depot at Gievres, were varied and interesting.

The Chief Sanitary Inspector was stationed at Headquarters at Nevers; an assistant at Gievres; another at Nevers; another at Lyons. To mention a few of the interesting problems: one was the continuance of an occasional case of typhoid among our troops at the railroad shops at Nevers. This was due, we afterwards found out, to the water supply in the shops. There were two systems. One from the city for drinking, was filtered and excellent. The other, direct from the Loire River for use in operation of the plant, was infected. Even with large placards announcing the water dangerous for drinking, and guards placed over these outlets, young America would take a chance when not liable to be caught, with resulting cases; another problem was the building of some-

thing efficient to dry men's clothing, using the minimum of fuel. Organizations in which this was done showed a marked improvement in the health of the command, especially respiratory diseases. Many ingenious devices were built, especially among the 20th Engineers Forestry, working in the rain and woods.

While the Commanding Officers of all the organizations were reserve officers, and both they and their men could see in some cases no reason for some of the sanitary recommendations, it was interesting to note how quickly they tried to cooperate. It was necessary to be forever on the job, and hold them to it after making a start. The question of transportation of patients to the nearest point for hospitalization was always difficult. The Ford Ambulance was the type used almost entirely. Difficulty in repair was the trouble. At first they had to be sent to Vernuil, the auto repair shops. This was a long distance in many cases; no replacements were available, and great inconvenience resulted.

In November, 1918, a Ford motor truck with trailer was procured. The trailer similar to an Engineer tool truck. In it were all spare parts, tires, tools, etc., necessary to the life of a Ford. A skilled Sergeant was in charge. He visited all stations. All Ford ambulances were visited, repairs made as necessary, drivers of ambulances examined as to their proficiency and knowledge. This traveling repair shop solved all this trouble.

It was early felt that the long trip from a station to a hospital in one of these ambulances was responsible for the bad results in many pneumonia cases evacuated to hospitals. The fatigue and exhaustion resulting causing the patient to lose the one chance he had. Orders were given that these cases be kept where they were taken sick, and not evacuated. It is thought that results were beneficial.

Dental care of the men in all these scattered organizations was a pressing problem. Two Ford trucks, each with dental officer, his assistant, equipment, and chauffeur, made regular trips to all detachments outside of large stations or camps.

The medical care of the large numbers of men going to the Leave Areas was handled by the Camp Hospitals at Aix-le Bains, Chamenix, and La Bourboule. The Morgan Hospital at Aix-le Bains, built by the late J. P. Morgan in memory of his French friend and physician at this resort, was a most modern and up-to-date hospital, and had early been given by the town to the American authorities for the use of our troops. Strict orders covering venereal inspection and prophylaxis stations were issued by G. H. Q., A. E. F. Men coming to these areas from the Army and all sections A. E. F., and later certain areas assigned to certain sections, changing trains en route, especially in the City of Lyons, being

on a holiday, young, seeing a new country, friendly with everyone, with money to spend, and spending it, a certain number of young Americans, I am afraid, did as their inclinations and desires prompted.

In passing, it is a fitting comment to make that no government ever treated its fighting men with the consideration and watchful care that was shown by ours.

This opportunity to see the wonderful show places of France; the ease leave was granted to visit England; the opportunity to study in the French Universities; the University and schools established for our troops after the Armistice, are but a few examples. While no orders were given to the medical officers in the Intermediate Section, relative to giving medical attention to the French inhabitants of the town or country near them, still they were given to understand that such help, if it could be done without interfering with other duty, would be allowed, in fact encouraged. Much assistance was given, and as far as I know no charge was made nor was a fee expected. At one time during the second German drive, the French, as was their custom, filled their hospitals from front to rear. Those in the Intermediate Section were soon filled. At the town of Issoudun the medical personnel could with great difficulty care for their wounded.

The American medical officers of their own initiative, in addition to their duties at the flying fields, gave their services in the French hospitals for almost a month until this crisis was passed.

In a section as large and scattered as the Intermediate, the one single feature which, if the personnel was available, would have made for greater efficiency, was a Medical Casual Camp, of both officers and enlisted men.

Never was there personnel enough to establish this. One at the Headquarters of the section, to which all officers and medical department men assigned to the section could be sent, and from there reassigned, would have been of great aid.

Here organized as a company, all papers could be straightened out, men equipped, instruction carried out, both in drill and theoretical. Officers and men classified as to their special training, and reassigned to this proper duty.

All American Hospital trains, 16 in number, were sent to Headquarters of this section for equipment. At this point was the shops of the R. R. engineers, and the Medical Supply Depot at Cosne was but a short distance.

The medical personnel, 3 medical officers, 28 enlisted men—2 of them being cooks—2 female nurses, and one enlisted man of the Engineers in charge of mechanical repair, assigned, and train started on its journey of mercy.

These trains were made in England, were complete in every detail, very comfortable, even elegant. They consisted of 16 coaches of the English type. Patient being loaded from the centre. Carried 360 lying down, or from 500 to 600 sitting and lying.

The Medical Personnel of the Intermediate Section varied from 94 Medical Officers, 17 Dental Officers, and 793 Medical Department men in January, 1918, to 397 Medical Officers, 94 Dental Officers, 10 Veterinary Officers, 27 Sanitary Officers, 2,894 Medical Department men, in June, 1918. The troops stationed in the Section varied from about 28,000, in January, 1918, to about 170,000 in November of that year, stationed in about 87 different stations.

Care of the sick showed that in February, 1918, 1,340 new cases a week came on sick report. Of these, 40 were pneumonia, 216 mumps, 103 venereal, 42 measles, 6 meningitis.

The high point was reached in November, 1918, when 8,845 new cases a week, 509 of them being pneumonia, 412 mumps, 280 venereal, 47 measles, 14 meningitis; 158 deaths a week, mostly from pneumonia, was the high point at this time.

A study of the movement of the sick, as shown by the weekly telegraphic report, especially regarding contagious, is of interest. This, of course, occurred in France after the mobilization of our troops in America, and the epidemics we had in this country.

Pneumonia was present always, from a few cases at first to 509 cases a week during November while in the midst of the Influenza epidemic, with 158 deaths a week.

Mumps increased from 216 cases a week to 507, with the increased number of troops.

The camps in the States did not seem to eliminate this contagion, although it was prevalent among the children in France, who were often seen on the streets with simply a handkerchief tied around the head. They were possibly a source of infection. Venereal disease increased after the Armistice. Measles seemed to have been overcome before troops left the United States, increasing from 42 a week among about 28,000 to only 47 among about 170,000, although, of course, it is known that only a certain proportion of men are susceptible to this infection.

Cerebro-spinal meningitis varied from 2 cases a week among 28,000 to 14 among 170,000, and applying the rule that 2 cases of meningitis in a single unit of an organization constituted an epidemic in this disease, and called for a quarantine, no epidemic was ever present among the troops in this Section. One case of smallpox was reported, but some doubt as to the correctness of diagnosis is felt.

One constant source of avoidable deaths, was from men being killed

upon French trains; 87 so lost their lives in the Area of this Section. In spite of printed warnings on trains, in depots, verbal orders and admonitions, men would climb on top of cars, lean out of doors. The bridges, tunnels, etc., on French roads allow no room except for the car alone, and death always resulted from these accidents.

All this amount of medical activity was carried on by the medical officer fresh from civil life. During this time there were but 6 officers from the Regular Medical Corps of the Army on duty in the Section. Later, after the Armistice, a few others were sent; 391 medical officers were but a short time before doctors in civil practice. Their services were at all times, and in all places, loyal, efficient, and willing. A very small percentage of them were tried for offenses against military rule; mostly for overindulgence in the wine of the country. A few transferred at the request of their Commanding Officers. They had every possible problem of sanitation, medical supplies on account of railroad congestion were slow in reaching them, sometimes never arriving at all, contagious diseases they had with them always, ambulances were scarce in the Section.

Their personnel was new and untrained. The troops they served were new and untrained, both officers and men. In spite of all these handicaps they did their best as they saw it, and it was efficient; and I desire on this occasion to add my tribute of praise and appreciation, from first-hand knowledge, to the great part played by our own profession in making our effort in France successful.



PULMONARY TUBERCULOSIS, PULMONARY MYCOSIS AND PULMONARY SPIROCHETOSIS

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THE above three diseases are of the acutest importance to the medical man, especially to the public health officer, as they all are incapacitating as well as preventable, while the mycotic and spirochetal infections are, to a degree, curable by medication. While tuberculosis of the lungs has received, and is receiving, its full share of attention from the medical man, as much can not be said of the other two diseases. This, no doubt, is due to a lack of appreciation of the cosmopolitan nature of the two infections. For there is no great uncertainty but that careful bacteriological examinations would reveal many mycotic and spirochetal infections diagnosed clinically, and being treated for, tuberculosis—this with special reference to the more Southern States; and greater emphasis must be placed, in regard to this point, in reference to cases coming from the Philippine Isles.

In carefully examining the weekly health returns of the city of Bangkok it is found that from 17 to 33 per cent of the deaths are reported as due to tuberculosis of the lungs. A careful examination and observation of pulmonary cases applying for treatment at one of the local charitable institutions shows that 25 per cent are mycotic or spirochetal, and the remaining diagnosed as tuberculosis, although only 10 per cent of these can be confirmed bacteriologically. No doubt animal inoculation would give a greater percentage. In one of our asylums an examination of one hundred patients with symptoms of disease of the lungs showed 60 per cent spirochetal infections, either pure or associated with other pulmonary conditions such as tuberculosis or moniliasis. It is to be noted, of course, that the housing conditions of this institution are not the most up to date, the result being a too intimate association with consequent direct infection, which, however, illustrates the method of dissemination.

Symptomatically these three conditions are not to be differentiated. For clinical purposes we may divide the spirochetal and monilia infections into acute and chronic, and it may be stated, without detailing the symptoms, that every variation between these two stages is to be met with. There is no sign or symptom in pulmonary tuberculosis that may not be simulated by a spirochetal or monilia infection even to the extreme emaciation and not infrequent terminal hemoptysis.

It has been noted that the character of the sputum in a pure spirochetal infection has a tendency to be watery or muculent, while with a mixed infection—tuberculosis or moniliasis—it is mucopurulent.

A diagnosis is made in the laboratory. Tuberculosis is ruled out absolutely *only after animal inoculation*. For moniliasis, a glucose agar culture will in from 24 to 72 hours produce a growth. Great care must be taken in collecting the sputums and in preventing air contamination, as moulds from the air, especially in the tropics, are picked up with the greatest ease. Direct examination of slides will suffice for the diagnosis of a spirochetal infection, silver nitrate stain giving the best results.

In making a differential diagnosis, especially in the tropics, the acute cases must be distinguished from a variety of acute fevers and such mosquito-born infections as dengue, malaria and possibly acute filarial infections, also from pappatacia or sand-fly fever. The chronic cases are more often mistaken for tuberculosis.

As regards treatment, more may be expected in cases of spirochetosis and moniliasis than in tuberculosis. Arsenic in the first, and the iodides in the second, quite often produce rapid improvement and not infrequently absolute cures. This is to be marked in uncomplicated cases.

It is to be hoped that medical men will appreciate more fully the cosmopolitan nature of these last two infections and put more emphasis on the laboratory diagnosis of pulmonary infections and less on the physical signs and symptoms. Especially is this so for medical men practicing in the tropics or sub-tropics.

From a prophylactic viewpoint the same measures apply that are practiced in the prevention of tuberculosis, while from a curative stand satisfactory results may be anticipated by the simple administration of the proper medicament, either arsenic or the iodides, as the case may be.

Original work was done in the field of monilia and spirochetal infections by Castellani, and for details the reader is referred to Castellani and Chalmers's *Manual of Tropical Medicine*.



THE TRAINING OF SURGEONS FOR SURGICAL TEAMS¹

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A GREAT MANY papers have been written on war surgery since the close of the great war. There has been much discussion and at times caustic criticism of our methods, but no one who has served in the advance with our armies and has had opportunities through previous service with our Allies can cast any reflection on the spirit and patriotism of the civilian surgeons who dropped their work and were transformed overnight into battle casualty surgeons. Untrained, unorganized, and with no clinical experience in the work they were to be called on to do, these men were sent to the front as surgical teams and there had to get their experience as best they could. Is it any wonder that conscientious operators were appalled at the problems that confronted them, and often expressed the wish that they might have had instruction to fit them for the task before them, instead of military drills?

Not that any one familiar with army life would minimize the value of discipline and drill, but that the most of the men who came over from the camps to the front seemed to have had only the drill and paper work. While this situation was noticeable in the early part of the Chateau Thierry engagement, it was much less evident in the Argonne-Meuse offensive. The rapidity with which Americans gathered experience through observation and practice showed itself in the improved work of the surgeons, and those who had gained experience were eager to impart their knowledge to the newcomers. After all, constructive criticism is the only thing that has any value in teaching the lessons of the war, and whatever I have to say is with that object only. That we may never be as unprepared, and that what preparation we are given will be the kind that will fit us rapidly and accurately, and with as little misdirected work as possible, to meet our problems in the next war, is the wish of every one who has seen service.

Here the question naturally arises, what is the best training of a battle casualty surgeon or a surgeon in the advance? The old adage of square pegs and round holes has been exemplified frequently in our Army, and to my knowledge in the English Army also, where, for example, an able middle aged surgeon who had for years confined himself to one specialty in his work was sent to the front to do fracture work when he had not touched a fracture for years and by nature was not adaptable, or when a distinguished throat specialist was sent to

¹ Read at the first annual meeting of the Association of Military Surgeons of Illinois May 16, 1921.

the front in the battle of Passchendaele to give anesthetics. This cannot easily happen again if the plans of the Surgeon General's Office are carried out, and men are classified in time of peace according to their records and fitness (physical as well as mental) for their particular work.

Those who have served as surgical directors and administrators of advance hospitals in the war are convinced that because a man may be a capable general surgeon in a base hospital it does not follow that he will be equally successful in an evacuation hospital, where the work is apt to be crowded and apparatus scarce. There were times in the British advance area when the X-ray apparatus broke down and we were thrown on our own resources and ingenuities in the localization of foreign bodies. Some men would be nonplussed; others aroused and stimulated to greater efforts by such a contingency.

It is readily seen that to succeed in surgery at the front a man must possess adaptability, good powers of observation, mental alertness, and judgment. The last is not always found in young men, who are apt to be carried away by a desire for elaborate and time-consuming technic, which will cause them to prolong an operation to complete all the surgery in one sitting when only the most necessary work should be done and the rest left for the base. To get the patient off the table in as good condition as possible and remove any cause for further complications is the first desideratum in surgery at the front, and this requires good judgment—a rare gift, but one that can be cultivated.

It goes without saying that a good physique is necessary to withstand the privations and tremendous pressure of work that one is liable to be subjected to in the advance, and here youth will be served, but not always, for unless the youth knows how to take care of himself, get the proper rest whenever possible, and see to it that he is properly clothed and fed, the old campaigner with his experience and foresight may outlast him.

I remember a surgeon who joined us in the Argonne. He was too old for the Army, so he came up with a Red Cross Commission. He was a sportsman, a hunter, and out-of-doors enthusiast with a lifetime of training in outing and woodcraft, and he not only did good surgery but came through in good physical shape. So you see, previous experience is of value, and there can be no doubt that the lessons we learned in this respect in the late war if properly applied will be a great benefit to us in the next. The mental equipment of a surgeon of the advance is quite as important as the physical; and, before all, granted a good working knowledge of medicine and surgery, I would place the necessity of a thorough knowledge of anatomy.

The operator may be well up on the latest diagnostic theories, he

may know the technic of all the popular operations, and yet be a failure if he has forgotten his anatomy. Except in surgery of the chest and abdomen, where, if the work is radical, it must be done in 24 to 36 hours after the wound is received, most of the wounds are left open. Amputations are by the open method and drainage is the rule, leaving the closure and adjustment of tissues for those at the base. The first step of the operation is done at the front—the work completed at the base. Thus it is evident that it is of first importance that the operator who explores a region for a foreign body or attempts the preparatory treatment of a gunshot wound with a fracture of the femur, must possess a knowledge of anatomy. Next in order of importance is a good practical acquaintance with infections; not the bacteriology of the laboratory and microscope, but the clinical signs, the appearance of the tissues and their behavior when invaded by infectious material. General infections, such as are met with in civil life, should be studied, as well as gas infection and tetanus. The surgeon should know the danger areas for gas infection. He should be able to distinguish between localized gas infection and the progressive type which rapidly becomes deep and malignant and demands bold and radical surgery. To know whether a certain infection is saprophytic or not may decide the whole treatment of a case and be the pivot on which the life of the patient turns. In the early part of the Chateau Thierry engagement the C. O. of the hospital asked me to hurry through with my work and look at a very bad case of "gas gangrene" that had been brought in that was also alive with maggots. Now, some of us learned the summer before in Belgium that, as far as our observation went, those saprophytes were never active in the same wound at the same time and if the maggots were there the man's life was saved; which goes to illustrate that one's knowledge of infections should be practical.

I wish to take exception to the statement of some that civil surgery is so different from war surgery that our experience can be of no use to us in civil life, for I believe that if nothing remained to us but what we learned of the treatment of compound fractures, our war experience was well worth while. The rediscovery of the Thomas splint was the greatest boon, and as its use becomes better known in this country I predict that it will displace as much of our fracture apparatus as it did in the late war.

The success in the treatment of compound fractures at the base depends largely on the primary surgical work at the front. The surgeon should know how to rid an infected wound of the dead soft tissues and remove all unattached bone. Small splinters of bone with no periosteal attachment are foreign bodies in an infected war wound. In the World

War joint surgery reached a pinnacle of achievement that will confer a lasting benefit on mankind. Its evolution would furnish interesting reading. No more do we drain septic joints, but remove the debris close to the joint and mobilize. If the tension within the joint shows a large accumulation of fluid, the removal of a stitch and passive motion will milk out the excess. Ankylosis is no longer dreaded in knee-joint operations, for we have learned when and how to mobilize our joint cases.

In the surgery of wounds of the chest and abdomen time is the deciding factor. A case over 36 hours old should be left for observation, and drainage is all the surgery that should be attempted. Of course, one should not neglect to close a sucking wound of the chest at any time. On the other hand, we have sufficient evidence to show that a patient received early enough and in the hands of a skilful and rapid operator of good judgment is entitled to radical surgery, and I believe our results will bear out this opinion.

You recall the high mortality of abdominal wounds operated on during the civil war. English surgeons had the same experience in the Boer war, due to the length of transportation and heat; and in the Russo-Japanese war the record is much the same, but by pushing surgical teams up as far as the field hospitals and getting the cases early we found the results of radical surgery so gratifying in the Chateau Thierry engagement that we were converted to this method.

A satisfactory discussion of wounds of special regions would require too much space for a paper of this sort. Briefly, I would say that most head cases should go to the base, but wounds of the jaws and mouth should have the mucous membrane sutured as well as enough muscle to close the wound, and a jaw splint and bandage applied to fix the fractured mandible and afford comfort to the soldier in transport. The question as to whether a laminectomy should be done to remove a foreign body or pressure on the cord depends upon whether immediate evacuation is necessary, for such cases may need more care than can be given in a hospital train.

Wounds of the urinary bladder, the genitals, buttocks, neck, and Scarpa's triangles as well as the popliteal space need immediate attention. Hemorrhage may prove a stumbling block in the career of the surgeon at the front, unless he adheres to certain principles in handling wounds. He should know the danger areas for hemorrhage and be quick to recognize concealed hemorrhage in these areas, and should never be satisfied to tightly pack a wound and trust to luck, but should freely expose the wound area and ligate the offending vessels. Packing for hemorrhage, unless the oozing is slight, is unsafe, for as soon as the

man's blood vessels fill up again the clot may flow out and the next flow be fatal. Again, packing may interfere with the distal circulation so seriously as to cause infection or gangrene. Take, for example, a wound through the popliteal space. It is better to make a transverse incision and turn back the heads of the gastrocnemius and ligate each bleeding vessel separately than to use mass ligatures or packing to check hemorrhage. The neck is a very dangerous area in which to attempt the removal of a foreign body. Blind probing is out of date and is no longer used. If there is any doubt as to whether large blood vessels may be injured in operating it is better to leave the missile until a fluctuating abscess permits a more ready detection. A large percentage of the work of the operating room consists in the removal of foreign bodies. It is essential that this should be done with the least amount of traumatism, and this means that the position of the foreign body should be definitely known before the operator begins to work. The localization of foreign bodies becomes almost an art in itself, and the development of that art, if one may so call it, in the late war would be perfectly amazing to a civil surgeon. I remember a young English surgeon I worked alongside of who had an almost uncanny surgical sense in following up the track of a missile. That was my first impression when I joined the organization, but a little observation taught me that he had formulated certain principles as a basis and with these worked out his technic. The surgeon at the front will find that his work is not all operating. He may be called upon to take charge of the triage. Some men expressed a dislike for this duty, but I believe it affords splendid training in studying the difficult types of wounds and in classifying cases for transportation, operation, or shock treatment.

After experience in hospitals where dressings were done by special dressing teams and also where the surgeons did their own dressings, I am convinced that the surgeon himself should dress or at least oversee his dressings, for only by so doing can he study his results and correct his mistakes. The surgeon in the advance must be trained as an all-round man, prepared for any emergency and willing to take his place wherever he can be useful.

The day has passed when the civilian doctor can be slovenly in dress and deportment and make the excuse that he is too busy. If this is the case with the civilian, how much more is it in the Army where the officer sets an example to the N. C. O's. and men. Careful attention to dress and deportment at the front goes a long way in keeping up the morale of the men, and there are no circumstances under which the officer can afford to lower his standard. I am not defending our tunic. It could be made more comfortable; also the wearing of trousers in the

wards and operating rooms would add to our comfort, but on formal occasions and outside duty we should conform strictly to regulations.

It is not necessary to add that the casualty surgeon must know the honors, courtesies, and ceremonies, as well as some of the rudiments of drill, and he must be particular to always observe these formalities of army life, but he is first of all a surgeon. The C. O. who is big and broad enough may not notice defects in these things, but he will not overlook an error of surgical judgment which may cause a man to lose a leg.

I have touched upon some of the surgical training that a civilian surgeon should undergo to make a successful surgeon at the front. Each one of these subjects could be largely elaborated, but at least they may furnish food for thought and perhaps some suggestions to the young surgeon who wishes to head a surgical team in our next war. If, after he has covered these subjects to his satisfaction, he has added sound surgical judgment to his armamentarium he will be qualified to fill his post with honor.



TREATMENT OF ACUTE EMPYEMA BY A CLOSED METHOD¹

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CHEST SURGERY had an exceptionally wide field during the World War because of the frequency of chest injury and the influenza epidemics with the complication of empyema. During the past two years there has been a deluge of literature on the subject of empyema with various methods advocated.

The treatment of empyema in the past has been difficult and perplexing, and the results unsatisfactory from any method. It is believed that any method which offers improvement over the older methods of treatment is worthy of consideration.

It is only right and proper that one should have the utmost respect for established institutions but at the same time be not unmindful that frequently the "authorities" of today are discredited tomorrow, and therefore it is well to be very cautious in forming permanent opinions.

This article is based on a series of 69 acute empyema cases, 45 (See *Am. J. Med. Sc.*, May, 1921) in the Army and 24 in civil practice, operated upon by the writer. There was one death in the former and two in the latter series.

Contrary to the classical maxim, "*ubi pus ibi evacuae*," there is now and likely long shall be a wide difference of opinion as to just how and when to evacuate pus from the pleural cavity.

The surgical treatment of empyema may be divided into two general methods: (1) the open methods and (2) a closed or "occlusion" methods. The open methods have a high mortality rate, familiarity and the prestige of surgical tradition while the closed or occlusion methods have a low mortality rate and this familiarity and prestige to combat.

Either of the two general methods have many subdivisions relative to the surgical procedure, manner of drainage, irrigation and negative pressure.

From November 11, 1917, to December 18, 1918, it was the writer's privilege to be stationed at the Walter Reed General Hospital, Washington, D. C., and most of this time in charge of the empyema ward.

On one morning four young men were operated upon here for acute empyema. The usual intercostal incision was made and through two large drainage tubes about one liter of pus in each case evacuated.

¹ Read at 29th Annual Meeting of the Association, Boston, Mass., June 2-4, 1921.

Upon opening the pleural cavity there was the usual picture—collapse of the lung, shock, gushing of pus, rapid breathing, quick pulse and the anxious expression on each face. The results were similar to those experienced in many of the Army hospitals at this time. One patient died the first night, one died two days later, and the other two had long convalescent periods. While the condition of the patients and the virulence of the infection were no doubt largely responsible for the fatalities, the operation itself can justly be considered an immediate and important factor.

While stationed at the Walter Reed Hospital the writer began the development of a closed method technic by which he has operated upon 69 acute empyema cases. All were classed as acute cases; however, some of them were of several months' duration but never operated upon.

Forty-five cases were operated upon in the Army and previously reported. (*J. A. M. A.*, Dec. 21, 1918, and *Am. J. M. Sc.*, May, 1921.) The remaining 24 were operated upon in civil practice and will be reported later.

Perhaps Bukh was first to treat acute empyema through a small tube held air-tight in the chest wall so as to maintain negative pressure, prevent collapse of the lung or the escape of pus around the tube. Immerman in 1887 described a modification of this method. No syringe was used to remove the fluid nor was any fluid injected. Since this time many modifications of the method have been tried with varied success.

Among those doing work along this line during the World War were Diederich,¹ Manson,² Ralls,³ Whittemore,⁴ Phillips,⁵ Harloe,⁶ Quinlin,⁷ and Mozingo.⁸

Though the basic principles are much the same in these various methods advocated, there is a wide difference in the technic.

December 18, 1918, the writer was transferred to Camp Pike, Arkansas, and given charge of the empyema wards in the Base Hospital. Up to this time Diederich had operated here by his method 107 acute empyema cases, 74 of which were still in the hospital and 49 under treatment. These latter cases, except four, were soon healed by the combined treatment of Dakin's solution and the formalin-glycerine. The writer operated upon 22 cases without a death, making a total

¹ Diederich—*Surg., Gynec. and Abst.*, April, 1919.

² Manson—*Am. J. Med. Sc.*, Aug., 1919.

³ Ralls—*So. Med. J.*, Nov., 1919.

⁴ Whittemore—*Boston Med. J.*

⁵ Phillips—*J. A. M. A.*, May 3, 1919.

⁶ Harloe—*J. A. M. A.*, Dec. 20, 1919.

⁷ Quinlin—*Ill. State Med. J.*

⁸ Mozingo—*J. A. M. A.*, Dec. 21, 1918, *Am. J. Med. Sc.*, May, 1921.

of 129 acute empyema cases having had a trocar thoracotomy at Camp Pike. Only nine cases had died. Four of the fatal cases were bilateral. Seven of the cases died during the height of the influenza epidemic when there was a shortage of both help and room. Of the 129 cases nine were transferred to other hospitals and only six had a secondary operation. The writer is not aware of a better record in so large a series.

Technic.—The method, in brief, is the introduction of a small tube into the empyemic cavity by means of a trocar cannula (the trocar and syringe used in this work are made by Becton, Dickinson & Co., Rutherford, N. J.) and the removal of the fluid by the suction of a one-half ounce Asepto syringe. The tube is held airtight by the chest wall and the secretions are removed from two to six times daily, followed by cleansing of the cavity with saline or Dakin's solution, and later a 2 per cent dilution of liquor formaldehyde in glycerine.

The operation is without shock and 2 cc. apothesine will prevent pain. A stab puncture is made 5 mm. long through the skin and fascia only. The chest at full inspiration, shoulder forward and a little vaseline on the cannula will facilitate the introduction of the trocar. The cavity is emptied at operation, but slowly, so as to allow accommodation of the circulation to the change of pressure. Cases operated upon earliest after onset of the disease give the quickest and best results.

The dressing consists of a one-inch pad beneath and one above a No. 0 safety pin thrust through the edge of the tube. A two-inch pad, with a hole in the center for the tube, is held in place by four strips of adhesive $1\frac{1}{2}$ inches by $3\frac{1}{2}$ inches, placed to form a square. If the skin puncture has been made properly, the cough controlled, the secretions kept removed, and due care taken in not injecting too much fluid during a treatment there will be no escape of fluid around the tube and soil the dressing which usually lasts several days.

The point of election for operation in general empyema is the 8th space post axillary line while in encapsulated cases it is the most dependent point. The trocar should never be introduced except at the same point where fluid has been found just previous with the diagnostic needle. If pus can be obtained where needle point is at least one-half inch inside the cavity, there will be no danger of injury to the lung with the trocar, which, however, should be short and have a rather blunt point.

The tube should be about 15 inches long and about 5 mm. in diameter. Larger tubes are likely to cause pressure necrosis. It should extend inside the cavity from 3 to 5 inches and have from 4 to 7 large fenestrae 1 cm. apart in the side of the tube to facilitate the removal of the fluid

especially when fibrin clots are present. The fibrinous exudate, however, is soon dissolved by the powerful solvent action of Dakin's solution. Hyclorite for making Dakin's solution used in this work has been found to be effective and convenient.

The treatments vary according to the condition of the patient and the cavity. Treatments are usually given every 2 to 6 hours until the fibrinous exudate has been dissolved and the secretion checked, which process usually takes place in from one to four days. The treatments may now be reduced to 2 or 3 daily, or under favorable conditions the vigorous treatment may be continued and cures effected in shorter time. It is best that the doctor give at least one treatment daily, while the other treatments can be given by some member of the family or by having an extension for the tube it is possible for the patient to treat himself.

To demonstrate that the drainage is complete a known amount of fluid can be injected and all recovered immediately regardless of the position of the patient. The same thing is true of air.

Adhesions soon form because of the frequent, thorough cleansing of the empyemic cavity and the pleurae being held in contact by the constant negative pressure. A fair idea of the size of the cavity can be determined by opening the tube, thus permitting air to enter as the lung collapses and counting the number of syringe-fuls of air aspirated. In small encapsulated cases the number will be proportionately small while in general empyemas the number varies greatly. For the first few days after operation the amount may reach from 40 to 60 syringe-fuls or even more according to the duration of the case, the thickness of the pleurae and amount of fluid removed. When the number has been reduced to about 10 syringe-fuls, usually within two weeks from 5 to 10 cc. of formalin-glycerine can be injected once or twice daily. It is not advisable to use this solution over a week. When the resultant secretion becomes a clear, sterile serosanguineous fluid about 5 cc. of the formalin-glycerine should be injected, the tube removed and the sinus closed with adhesive plaster.

This closed method is not as simple as it might seem to some nor as difficult as it might seem to others. There are many details upon which success depends. There is a right way to insert the tube and a right time to remove it, but perhaps 80 per cent of the success depends upon the post-operative treatment, which should be individualized for every case. One, therefore, must not stop at the mere insertion of the tube, and hope for success. Not a little unjust criticism has come from those who failed with this method because the technic was not followed carefully.

Most advocates of the open method are well agreed in a course of preliminary aspirations to allow adhesions to form and prevent collapse of the lung when the chest is opened. The trocar thoracotomy, which is but little more than a diagnostic puncture, may well be offered as a substitute for the preliminary treatment. With a small tube into the empyemic cavity the secretions can be removed at frequent intervals without pain and the end results accomplished even more quickly by the injection of Dakin's solution because of its solvent and bactericidal action. This method is most valuable in the acute suppurative stage, especially with the streptococcal infection in which the secretion is both toxic and profuse.

The small encapsulated empyema is usually a simple matter by any method of treatment, as a rule less than two weeks by the closed method.

Summary of the 45 acute consecutive cases treated in the Army.

Number of cases having a bronchial fistula.....	8
Number of cases requiring a secondary operation.....	1
Number of cases having a secondary operation before closed method treatment was completed.....	5
Number of bilateral cases.....	4
Average number of days tube was in cavity.....	25 2
Number of cases having tubes less than two weeks.....	18
Number of recurrences.....	0
* Largest amount of pus removed at operation.....	7240 cc.
Average number of days patients were in bed after operation.....	7
Number of cases requiring but one dressing.....	8
Number of cases requiring not more than three dressings.....	20
† Number of deaths (a bilateral).....	1

* This is believed to be the largest amount ever removed at one time.

† Patient had been sick six weeks. Two quarts of pus removed from right side one day and same amount from left side next day. Death three weeks later. Had positive blood culture.

The results in 24 acute empyemas operated upon by the writer in civil practice have not been so satisfactory as in the Army series of 45 cases. Various reasons are offered for this difference. The ages varied from sixteen months to sixty-two years. Patients lacked the vigor of the soldiers. The post-operative treatment in part was given by inexperienced help, seven cases treating themselves. Six cases had a bronchial fistula. The average time from onset of disease to operation was longer. There were two deaths.

One of the fatal cases, a man aged thirty-five, well nourished, was somewhat delirious and practically moribund when operated upon and 900 cc. of pus evacuated. There was immediate improvement due to relief of pressure; however, the delirium continued until terminated by death two days later at the crisis of pneumonia. No autopsy.

The other fatal case was a colored man aged twenty-eight, large pyopneumothorax, sick four months, weight 80 lbs. when 1200 cc. of pus were removed at operation. The pus showed tubercle bacilli and mixed infection. Six weeks previous to operation 1800 cc. of clear amber colored fluid were aspirated. The wound made by the needle and the bronchial fistula were still open when the patient died two months after operation. There was also a marked necrosis in the tissue around the tube. No autopsy.

While the prognosis in every case of tubercular empyema is extremely grave by any method of treatment the closed method offers the least discomfort to the patient. The clear amber colored serum found in the beginning of this disease should be aspirated only to relieve pressure symptoms, and under strict aseptic conditions. The serum can persist for months before pus is formed and the lung may become fixed in compression. Under such a condition no amount of negative pressure could expand the lung, and in cases where the lung can be expanded a latent tubercular lesion might become active.

Cases complicated with a bronchial fistula make negative pressure impossible and irrigation difficult at times. The cavity can be kept emptied, and it is best to use salt solution until the fistula closes. Only such amounts are injected as the cavity will hold without any of the fluid entering the fistula. This maximum amount varies with the size of the cavity location, and size of the fistula and position of the patient. Dakin's solution, however, is not contraindicated if kept from entering the fistula. The fistula usually heals within two weeks but may persist for months, and such cases are more likely to have a recurrence.

In the above series of 24 cases there were six cases with a bronchial fistula with histories as follows:

Case 1.—Girl age 3 years, sick one month following pneumonia, pyopneumothorax, fistula closed sixth day, tube removed tenth day. Cured.

Case 2.—Woman age 33 years, sick five weeks following pneumonia; general empyema; 1920 cc. pus removed; fistula healed eighth day; tube removed twenty-seventh day. Cured.

Case 3.—One of two fatal cases reported above.

Case 4.—Boy age 16; sick twenty-one months following influenza; very productive cough for nineteen months; right chest sunken and expansion retarded about one-half; trocar thoracotomy yielded 950 cc. pus; pleura thickened; one liter of pus had been aspirated monthly for the six months previous; only one treatment daily for which he came to office on street car. The dressing was not touched for twenty-one days when the two small pads were changed and the tube withdrawn one inch.

One week later the two small pads were again changed and the tube withdrawn one inch. The fistula now closed and the maximum negative pressure caused much pain. The tube and original dressing were removed on the 39th day. Weight 110 lbs. Gain of 32 lbs. Five months later passed examination and joined the Navy.

Case 5.—Man age 34; sick five months following pneumonia; very productive cough four months; 720 cc. pus evacuated at operation; pleura about one-half inch thick as determined by diagnostic needle, trocar and physical examination; left upper chest sunken, and expansion diminished about one-half. The fistula seemed to close on the 5th day and the tube was removed in one month. This case recurred a second time, and at present, seven months after first operation, has a small sinus and the general condition is good.

Case 6.—Man age 18; sick five months following pneumonia; anemic; emaciated and left chest expansion diminished about one-half when operated upon and 2160 cc. pus removed. Two months previous the patient had a sudden paroxysm of coughing and raised a large quantity of pus. The cough stopped after two weeks. Three weeks after operation the bronchial fistula closed but the patient was unable to endure the pain caused by the maximum negative pressure. The lung gradually expanded, but the tube was removed rather prematurely before the cavity was obliterated. The sinus broke open after three weeks, and another tube was inserted. There was no cough and the unhealed fistula prevented negative pressure. This tube was removed after a month though the cavity was not obliterated. Again there was a recurrence and rib resection resorted to. Saline, Dakin's solution and formalin-glycerine solution had been used in this cavity. Most of the treatments had been given in the home by a member of the family and the patient himself. This is the second case in the series of 69 acute cases which necessitated a rib resection.

There are in practically every large series of empyema cases those cases which may be classed as residue. In the summer of 1919 when the Base Hospitals of several of the large Army camps were closed each hospital had a residue of chronic empyemas which had been draining for months. These cases were transferred to different centralizing points, and most of the cases subjected to secondary operations of the Schede, Eastlander and Delorma type.

When the empyema ward was closed at Camp Pike, June 16, 1919, there were 21 empyema cases transferred to General Hospital No. 12, Biltmore, N. C. Thirteen of these cases had been operated upon overseas by the open methods on an average of about four months previous. Three of these cases were admitted just before the transfer and the

others had been under closed method treatment too short a time to effect a cure. Of the 8 remaining cases one had been operated upon by the Phillips method, 4 Diederich's and 3 the writer's method. Of the latter three cases one was healed and has needed no further treatment; one had been operated upon only two weeks before the transfer and the other was a bilateral case, one side of which was permanently healed, but the other side had a persistent bronchial fistula of three months' duration and required a secondary operation.

Two cases have been recently treated by a combination of the closed and open methods with very gratifying results. This method of treatment for the first week or two is the same as in the closed method, then the tube is left open for free constant drainage and no formalin-glycerine solution is used.

After the first week one side of the dressing should be raised, the small pads changed, and the pin readjusted after the tube has been withdrawn one inch. The holes in the tube made by the pin should be covered with a strip of adhesive. By the end of the second week the cavity will be greatly reduced, the secretions scanty, and adhesions formed, this preventing collapse of the lung so that if fewer than fifteen syringefuls of air enter the cavity when the tube is left open negative pressure is no longer a factor. The end of the tube can now be placed in a drainage bottle which can be carried in a pocket, or fastened to the clothing. The drainage is by gravity rather than siphonage, and it is, therefore, of very great importance that the tube be introduced at the most dependent part of the cavity. One cleansing daily will keep the tube open and hasten the obliteration of the cavity.

Instead of using the drainage bottle another method was used. The entire dressing is removed, and a two-inch pad, split to the center for the tube, is placed under the pin. The tube and pad are held in place by narrow strips of adhesive. The tube is cut off one-half inch from the pin and a pad placed over it to catch the secretion. The tube is shortened as the cavity diminishes. In order to cleanse the sinus the cavity is filled and the fluid forced to return around the tube which should be withdrawn until the fenestrae are within the sinus.

The average time for the course of needle aspirations preliminary to open operation is from two to three weeks. The trocar thoracotomy can well be substituted for this preliminary treatment and at any time in the course of treatment the open operation can be performed if so desired.

In other words, the ideal method, to our mind, is to drain the empyemic cavity with negative pressure and at the same time introduce an antiseptic solution in such a way that the cavity remains closed.

This principle is entirely opposite to the incision and drainage methods so that it meets with the opposition of those who know nothing except drainage.

Unfortunately, the success of any good method depends upon the carrying out of the minutest detail. If the details so necessary to success are not carried out, the result is a failure, but it is attributed to the method rather than to the incompetency of the individual.

The Carrel method for the treatment of infected wounds as used in the Allied armies was generally indifferently done. The reception which the Carrel method received at first on the part of the high priests and professors, engrossed with the eminence of their positions, was anything but complimentary. Where it was properly done, we can only repeat the words of General Ireland, "The results were simply marvelous." It is useless to discuss with many of our confrères anything which is at all different from the orthodox method of doing things. They cannot conceive of any new idea or new method. However, judging from the reports of those who are treating acute empyema by some form of closed method it is believed that in time the open method as a routine will be discontinued for some form of a closed method treatment.



ADDRESS TO R. O. T. C. STUDENTS IN MEDICAL
FIELD SERVICE SCHOOL, CARLISLE BARRACKS,
DELIVERED JUNE, 6, 1921

BY COLONEL P. M. ASHBERN
Medical Corps Commandant

Gentlemen of the R. O. T. C.:

You are, as it were, the first fruits of them that slept, the living evidence that our country is now at least partly awake to the need for military preparedness and that it is taking some wise measures toward provision of it.

According as you get much or nothing from your stay here will the wisdom of the establishment of R. O. T. C. and the reputation of this school be judged by many people, and for a considerable time, and it is incumbent upon you to try to get all that you can, for our sake as well as your own and our country's. As you know, this is a new school, now opening for the first time, now receiving its first students. Our courses and schedules are yet untried, our equipment is not what we hope it may become, our teaching experience is limited, and it was not until March 23 that we were told that you were to come to us. But we have tried to arrange for you the courses laid down in Special Regulations 44a and we feel that we can meet the requirements, although probably not as well as those of you who may return next year will find us doing them.

But to make the course as great a success as possible we need your help and your earnest efforts. You have been students long enough to know that without these we can teach you little. It is not the function of the teacher merely to pour information into you, and the best of teachers can not do it except by getting your own ambitions and desires aroused and interested.

You may find that military life puts such restrictions upon your freedom of action and demands such conformity to rules, which will often seem to you unnecessarily and severely restrictive, and even foolish as applied to you individually, as to cause discontents and grumbings. But as college men you must be able to glimpse the importance of discipline and of team work, and to realize that an army is a great team, efficient to the exact degree that it can operate as a team, an entity. You must realize that team work is discipline and that without discipline it does not exist. It is important that we start with a right understand-

ing of the meaning of discipline, as I believe that many people resent the very term because they think of only one meaning of it and that the least important in a school of intelligent men. And when I say that we should understand the meaning of the word, I do not mean that I want you merely to accept my meaning of it. I refer you to Webster's Dictionary, which defines the word in seven ways as follows: (I change the order in which the definitions are given so as to make them show progressively better as I go along.)

1. (Ecclesiastical) "Reformatory or penal action against one guilty of ecclesiastical offenses." That does not concern us.

2. "Correction, chastisement, punishment inflicted by way of correction and training." That is a form of discipline for the guard house, not for schools, and I trust that you will never see it used or needed in our work this summer. It is as hateful to give as to receive.

3. "Severe training, corrective of faults; instruction by means of misfortune, suffering, punishment, etc." I say the same of it.

4. "The subject matter of instruction; branch of knowledge." There is something more worth while, more becoming to a student.

5. "Subjection to rule; submissiveness to order and control." This is what we must attain in order to get a good baseball team, football team or army. Team work means "subjection to rule; submissiveness to order and control."

6. "Training to act in accordance with established rules; accustoming to systematic and regular action, drill." Is not that a description of the crew in training and of a fine sporting spirit? Is there a man of you who has ever been on or tried for a varsity team who has not lived that definition? If it is worth living for your school and your play, is it not worth living for your country and her serious needs?

7. "The treatment suited to a disciple or learner; education; development of the faculties by instruction and exercise; training." That, I think, is a choice and fitting definition of the discipline you should undergo here. You are here as disciples or learners, you are seeking to learn the duties of the soldier of the Medical Department, to learn them from doing them and to learn them so well that when, later, you become officers of the army, you will know what it is reasonable to ask and expect of your own men, so well that you can yourselves show the man who does not know how to do his work. You are all here to be educated, to be led out of the state of ignorance of military matters into that state of informed intelligence which will make you useful to your country in her time of need.

You are all seeking the development of the faculties by instruction and exercise, you all seek training. This, I say, is a jewel of a definition

of discipline as we desire you to learn it. It is not the discipline of the guard house or the prison, not that needed by the vicious, the lazy and the untutored. It is that applicable to the disciple who is eager to learn, to the educated man, to the gentleman. You are here on a status different from that of either the officers or the enlisted men. You are truly disciples and it is our business to teach you what the regulations say you must be taught in your respective courses and at the same time to determine whether you are worthy of the high calling which is open to you, a doubly high calling symbolized by the crossed sword and Aesculapian staff shown on our coat of arms, the calling of officers, gentlemen, healers. If your conduct equals that high aspiration you will need no other discipline than is described in the last two definitions I read you. If it be not so and your conduct shows you unworthy, we shall not attempt to instruct you by misfortune, suffering or punishment. We shall ask your separation from the school and the service and seek to disembarass ourselves of you. But we expect nothing of the sort. You have gone into the R. O. T. C. because you were interested and wished to prepare yourselves to serve your country. We hope to stimulate both your interest and your desire for service.

Remember that much is expected from him to whom much has been given—*Noblesse oblige*. I do not desire to make odious comparisons, but you have been so much longer subjected to mental training and activity than have the majority of the enlisted men, that you should and will be expected to learn much more readily. In addition most of you are the survivors of the system of elimination of the less fit which our social and educational systems favor, while many of them are the rejected. You are here to learn in a few weeks what they have been a much longer time acquiring. You can not, perhaps, equal the best of them. You should much excel the poorer. And we want your help, not only in preparing yourselves for your country's service but also in making this school a place of longer usefulness. That help you can give in two ways: first, by doing good work and so giving a good first year for the school and proving to others that our work here is worth while, and, second, by helping us to establish a fine sporting spirit of team work for the school, so that Carlisle may again shine, as it did in the days of the Indian School, as the home of clean athletics and good sport. Put your best athletic talent into a ball team and a track team and see if you can beat our enlisted men. Put your best vocal talent into a glee club and show us how music can beguile and cheer the hours of rest. And put such fellowship into your contacts with one another that you will always look back with affection upon the friendships formed here.

Remember, too, that we are located in a college town, and that you

will be judged somewhat by comparison with the student body of Dickinson College, and that, I can assure you, is no mean or low standard. We live with Carlisle and our reputation in Carlisle is what might be called our home-town reputation. It is yet in the making. Help us to make it high and fine. Always remember that these two fine professions which we follow, medicine and arms, do not as a rule pay much in the goods of this world, that they are the nobler for that reason, and that the follower of them is proud of them because of what they give an opportunity to do and to be rather than as roads to wealth, because of their opportunities for service rather than for greatness. And at all times show the faithfulness, the simplicity, the honesty, the charity and the bravery that should adorn both callings. Do this and you will have done well. Do this and when, from your own choice or because of your country's need, you join our ranks, you will be doubly welcomed, doubly useful, because of your training and your characters.

If there is anything in your treatment, your accommodations, your course of instruction, which seems to you unreasonable, unnecessarily hard or unwise, speak freely of it to your instructors or to me and do not allow discontent to grow. As I have said, we desire to make the course the best possible, and if your advice will help us to make it better for succeeding classes or for you, we want that advice.

Begin your team work now and be of us, as well as with us.

We welcome you heartily.



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Original articles, items of news and matter of interest to the Services are welcomed. Requests or reprints should be made at the time of forwarding articles.

EDITOR,

COLONEL JAMES ROBB CHURCH
Medical Corps, U. S. Army

EDITORIALS

THE BOSTON MEETING

Detailed account of the June 2-4 meeting will appear elsewhere in our pages, and the papers there read will be published as original contributions. Regarded from the standpoint of a literary program, the meeting was successful; from the standpoint of attendance, there was much to be desired. While there was a fair number present at each session, it was not commensurate with the membership, and should have been much larger. We had with us at this time seven representatives from Allied Governments who seemed interested in the work, and it seems desirable that more of us who are members of The Association should make a special point to come once a year to this annual gathering and add not only our bodily presence to the quota but also the further help of our mentality in the discussion of the papers which are read.

The reading of a paper in itself before an Association does not mean so much when it is subsequently published and may be read at leisure by any member of The Association. However, if it is read before a representative assemblage by the author himself and is subject to discussion by any of those who hear it, it has an additional value, inasmuch as those who differ with the author in regard to any of his theories or personal opinions have immediately the opportunity of stating their

own differences of opinion and of eliciting from him the reasons which he holds in respect to his own expressed views. Naturally, therefore, the larger attendance we have the more free discussion we shall obtain of these carefully thought out papers on scientific subjects, and the advantage will lie not only with those who hear the papers but with the authors themselves since they will get a slant on the viewpoint of other men interested in their specialty. No decision has as yet been made as to the meeting place for the 1922 session, but it is very urgently hoped that all members of The Association will make a special effort to be present, not only for their own education and interest and that of those who read papers, but that we may have for this distinctively representative association, unique in its aims and objects, attendance which is due its purpose and dignity. No member of The Association can plead ignorance as to the time and place of our annual convention, for this is stated for some months in advance and special notice of it is put in *THE MILITARY SURGEON* in many prominent places where it cannot fail to engage the eye of anyone who turns its pages.

Finally, it is desired to call attention to the Wellcome Prize Essay Competition, announcement of which is run in each issue of *THE MILITARY SURGEON*. This is a generous foundation by Mr. Wellcome in the interest of science and the betterment of medical knowledge, and it would seem that there should be no ignorance in regard to its existence and that it should offer an incentive for keen competition. It is worth while, not only for the cash prize attached and the very beautiful medal which goes with this, but also for the mental stimulus which it entails in the prosecution of original scientific work.

LIBRARY SERVICE FOR ASSOCIATION MEMBERS

The Editor in the odd minutes of office time between blue penciling manuscript that is not too bad, and apologetically returning that which *is* too bad, has made a card index covering the material published in the forty-eight volumes of *THE MILITARY SURGEON* from its beginning up to the current issue.

It has been possible also, from various sources, and largely through the kindness of Lieut. Col. D. S. Fairchild, Jr., M. C., U. S. A., to get together a duplicate set of these volumes. What has been published in *THE MILITARY SURGEON* contains a vast amount of valuable information, not only in regard to strictly military topics but also as to problems of medicine and surgery. In order that those writing papers or discussions on any particular subject may have the benefit of this knowledge, we wish to state that if any one so interested will write to this office, stating the subject in which he is interested, we will forward a list of article

indexed as pertaining to this specialty. Upon receipt of this list, if he will indicate those which are of special interest and which he desires to see, we will forward the numbers which carry this information, the understanding being, of course, that he is to pay postal charges both ways and to guarantee prompt return of what may be forwarded.

We hope that this may make for further usefulness of The Association to its members and that they may appreciate and take advantage of this offer.

WHAT IS THE ANSWER?

During the Boston meeting, in June, several members of The Association came to the Secretary and asked him why it was that so few members wore the ribbon in their lapels. They stated that they considered it in a measure a distinction and they had been struck by the fact that so few members put it in evidence.

We are perfectly frank in stating that we do not know what the reply to this query is. Can anyone suggest one?



ASSOCIATION NOTES

At a meeting of the Executive Council of The Association of Military Surgeons, June 1, 1921, the following names were proposed and elected to membership in the Association:

Medical Reserve Corps, U. S. Army

Brig. General

Charles E. Sawyer

Lieut. Colonels

George Fordham

Joseph Carroll Monmonier

Leonard G. Rowntree

Samuel R. Slaymaker

Frederick Cook Warnshuis

Majors

Francis E. Bouza

John A. Ceconi

Tilghman Opta Darby

David C. Donan

Marion Amos Emshwiller

Andrew Engberg

Jacob Carter Fisk

William O. Krohn

William J. Lancaster

John E. Morgan

Herbert C. Mowery

Rufus F. Parks

James H. Riffey

William Clarry Slusher

David Owen Thomas

Captains

Joseph G. Coleman

Francis Joseph Griffin

Charles Victor Haggman

Granville Tatum Hall

Tenney Tennyson Harris

Edgar Charles Hawkins

Richard Herrick

John Lincoln Hertz

John George Huber

Carroll Eckel Kriebbaum

Cassius True Lesan

Hugh Allan MacMillan

John L. Marker

William Edward Mogan

Bruce Dawning Parrish

Emory West Reeves

Frank L. Richards

Ernst L. Schaible

Howard C. Slaughter

First Lieutenants

Morris J. Baskin

Frank J. Chmelik

Abraham Goldberg

Otto L. Kahn

Rhett G. Korniker

Peter J. McGann

William Edward Mulcahy

Anthony M. Palermo

Maximilian Jean Seidner

Julius Benno Steinmetz

Charles Edward Tucker

Contract Surgeon, U. S. Army

Loy McMea

Medical Corps, U. S. N. R. F.

Lieut. Commander

John A. MacIsaac

Lieutenants

Michael Price de Boe

Paul B. Cooper

Kenneth S. Davis

Walter L. Deemer

Norman Walter File

Edward Lester Merritt

J. Edwin Purdy

Arthur Wildman

Associate Member

Cecil Walters Coad,

Major, Dental Corps, Minn. N. G.

COMMENT AND CRITICISM

INSTRUCTION AT MEDICAL DEPARTMENT SCHOOLS

The publication of the data given below was approved by The Adjutant General of the Army on May 13, 1921.

With reference to the accommodations to be set aside for members of the National Guard and Reserve Corps, the reader should bear in mind that assignments as student officers at the various service schools are contingent upon specific appropriations by Congress, and at this date the Army Appropriation Bill for the next fiscal year is under consideration.

Proposed Schedule of Courses For Officers of The Medical Department Regular Army, National Guard, and Reserve Corps At The Medical Field Service School, Carlisle Barracks, Pa.

Actual dates of instruction	Courses	Courses								
1921 June 6-July 13.	<p>(3) Short or special basic course for M.D. officers of the National Guard and Reserve Corps beginning 1st or 2d Monday in June and continuing for a period of 6 full weeks.</p> <p>Reservations:</p> <table><tr><td>Regular Army</td><td>75</td></tr><tr><td>National Guard</td><td>5</td></tr><tr><td>Reserve Corps</td><td>10</td></tr><tr><td>Total</td><td>90</td></tr></table> <p>During this same period there will be held annually at Carlisle Barracks a combined camp for Medical, Dental, and Veterinary Corps units of the R.O.T.C. in which the instruction will be essentially the same as course (3). (In addition, this year only, the present class at the Army Medical School will be given course (3) in lieu of the standard basic course (1). This accounts for the small reservations above given for officers of the N. G. and Reserve Corps, which would normally total 90.)</p>	Regular Army	75	National Guard	5	Reserve Corps	10	Total	90	<p>(5) Special advanced course for such M.D. officers of the Regular Army, National Guard and Reserve Corps as may elect studies in higher sanitary tactics, such as those including the duties of Army, Corps, or Division Surgeons. These courses will be from 1 month to 3 months' durations, and normally will be held during the months of May, June, and July, but arrangements may be made to enroll at any other time during the year if accommodations and facilities will permit. Reservations, Not fixed, being subject to special consideration of each individual applicant.</p>
Regular Army	75									
National Guard	5									
Reserve Corps	10									
Total	90									
August 1-December 21	<p>(4) Long or standard basic course for M.D. officers of the Regular Army, National Guard, and Reserve Corps beginning 1st or 2d Monday in August and continuing to the latter part of December.</p> <p>Reservations:</p> <table><tr><td>Regular Army</td><td>50</td></tr><tr><td>National Guard</td><td>10</td></tr><tr><td>Reserve Corps</td><td>30</td></tr><tr><td>Total</td><td>90</td></tr></table>	Regular Army	50	National Guard	10	Reserve Corps	30	Total	90	
Regular Army	50									
National Guard	10									
Reserve Corps	30									
Total	90									
1922 January 9-February 20	<p>(1) Short or special basic course for M.D. officers of the N. G. and Reserve Corps beginning 2d or 3d Monday in January and continuing for a period of 6 full weeks.</p> <p>Reservations:</p> <table><tr><td>Regular Army</td><td>None</td></tr><tr><td>National Guard</td><td>30</td></tr><tr><td>Reserve Corps</td><td>60</td></tr><tr><td>Total</td><td>90</td></tr></table>	Regular Army	None	National Guard	30	Reserve Corps	60	Total	90	
Regular Army	None									
National Guard	30									
Reserve Corps	60									
Total	90									
March 13-April 24	<p>(2) Short or special course for M.D. officers of the N. G. and Reserve Corps beginning 2d or 3d Monday in March and continuing for 6 full weeks.</p> <p>Reservations:</p> <table><tr><td>Regular Army</td><td>None</td></tr><tr><td>National Guard</td><td>30</td></tr><tr><td>Reserve Corps</td><td>60</td></tr><tr><td>Total</td><td>90</td></tr></table>	Regular Army	None	National Guard	30	Reserve Corps	60	Total	90	
Regular Army	None									
National Guard	30									
Reserve Corps	60									
Total	90									

NOTES

(a) At the Medical Field Service School, Carlisle Barracks, Pa., instruction pertains essentially to the development of the military part of an officer's education, special emphasis being given to tactical (field) training.

(b) At present the maximum accommodations provide for 90 student officers at one time. Facilities for expansion exist and in the future the capacity will be increased as funds for this purpose become available.

(c) With reference to the actual dates of instruction given above, it is contemplated that students entering the prescribed courses should always be directed to so time their departure as to arrive at least three days prior to the beginning of the course which they have been authorized to take. This is in order that they may accomplish all preliminary details before beginning actual instruction. Likewise the period for examinations, graduation exercises, etc., after the completion of the course is also left elastic.

(d) It will be noted above that the term *Medical Department officers* is used. As this is a tactical school and the Medical Department consists of officers of the Medical, Dental, Veterinary, and Medical Administrative Corps, courses are arranged for the combined training of all those officers. On the contrary, it is contemplated that only medical officers will be given technical medical training at the Army Medical School, although until other facilities are provided for them the veterinary and dental officers will be considered eligible for laboratory and other courses to be conducted in that school. Eventually the Medical Department will maintain a technical school for each of its major services, such as an Army Dental School, an Army Veterinary School, and an Army Nurse School, in addition to the existing Army Medical School.

(e) The long or standard basic course (4) is primarily conducted to meet the needs of all candidates for admission to the Medical, Dental, and Veterinary Corps of the Regular Army. It has as its object the rapid adaptation of the civilian practitioner to the life, work, and customs of the Army. The instruction is progressive and extends from the school of the soldier to the organization, functions, and administration of Medical Department units attached to the field forces or in home territory, in peace or war, such as regimental detachments, medical regiments, evacuation hospitals, surgical hospitals, hospital trains, general hospitals, station hospitals, etc. The course is also designed to prepare the inexperienced officer for the discharge of his military duties upon entering the service, irrespective of whether his assignment be with mobile or fixed formations. The course constitutes his induction into military life and is a prerequisite to admission to the professional (technical) school of his special corps. When the needs of the Regular Army have been met the remaining accommodations each year will be made available for M. D. officers of the National Guard or Reserve Corps who can spare the time to take this full course.

(f) The short or special basic course—(1) (2) and (3)—is designed to meet the needs of those officers of the National Guard and Reserve Corps who cannot spare the time to take the long or standard basic course. This short course will be arranged to deal, in a six weeks' period, with as much as possible of the same instruction and material as is embraced in the long basic course (4). It will be intensive and essentially practical.

(g) Special advanced courses (5) will be conducted for officers whose war or field experience indicates their fitness for advanced instruction. These courses will deal mainly with the organization, function, and administration of all field units of the

M. D. It is designed chiefly to develop commanding officers of special units and such staff officers as army, corps, and division surgeons. It falls under the general heading of what may be termed sanitary tactics. They are not strictly prescribed courses but are to be in the nature of post-graduate and research work with medical units, equipment, training, or in other subjects which special officers may be authorized or directed by the Surgeon General to undertake.

(c) A pamphlet giving all the details concerning the administration, courses, etc., of the Medical Field Service School will be published in the near future as part of the new Army Regulations now in process of preparation. Calls for copies of these pamphlets should not be made, however, prior to July 15, 1921.

(d) All applications for permission to take any of the courses outlined in this schedule should be forwarded at least two months prior to the opening of the course. Each application should specifically indicate the course desired and its inclusive dates as given in the schedule, and include the age of the applicant, a brief statement of his previous military experience and any training courses he has previously followed. No applications will be submitted for the course to be given from June 6 to July 18, 1921, the Surgeon General having already designated the officers who are to attend that course. Applications may be submitted for any of the other courses, beginning with that of August 1, 1921.

(j) The reservations herein given for each course in the case of National Guard officers will be handled by an allotment to the Chief of the Militia Bureau. All applications from members of the National Guard for permission to take any of the courses outlined, for which they are eligible, should be forwarded through military channels (i. e., National Guard) to the Chief of the Militia Bureau, War Department, Washington, D. C. If the number of N. G. applicants for any course exceeds the reservations herein given, the Chief of the Militia Bureau will decide as to how the attendance shall be apportioned.

(k) The reservations herein given for each course in the case of reserve officers will be handled by an allotment to corps area commanders, an equal distribution being made to each corps area. Applications from members of the Reserve Corps for permission to take any of the courses outlined, for which they are eligible (except that for June-July, 1921) should be forwarded to the commanding general of the corps area in which the applicant resides. If the number of Reserve applicants for any course exceeds reservations herein given the corps area commander will decide as to how the attendance shall be apportioned.

(l) All applicants on the active list will forward their applications through military channels.

Proposed Schedule of Courses For Officers of The Medical Department Regular Army, National Guards, and Reserve Corps At The Army Medical School, Washington, D. C.

Actual dates of instruction, 1921-22	Courses
1921 July and August	(No courses for officers during these months; enlisted men only receiving instruction.)
September 5-December 21	2) Special advanced (post-graduate) courses only for Medical Department officers of the Regular Army, beginning 1st Monday in September and continuing necessary to the latter part of December. Reservations: Regular Army 20 (normal) National Guard None Reserve Corps None Total 20
1922 January 9-June 21	(1) Standard basic course in technical subjects for Medical Department officers of the Regular Army, National Guard, and Reserve Corps beginning 1st or 2d Monday in January and continuing until the latter part of June. Reservations: Regular Army 50 National Guard 10 Reserve Corps 15 Total 75

NOTES

(a) At the Army Medical School, Washington, D. C., instruction pertains essentially to the development of the professional part of an officer's education, special emphasis being given to technical (medical) training.

(b) At present the maximum accommodations provide for 75 student officers at one time.

(c) With reference to the actual dates of instruction given above it is contemplated that students entering the prescribed courses should always be directed to so time their departure as to arrive at least 3 days prior to the beginning of the course which they have been authorized to take. This is in order that they may accomplish all preliminary details before beginning actual instruction. Likewise the period for examinations, graduation exercises, etc., after the completion of the course is also left elastic.

(d) It will be noted above that the terms—*Medical Department officers* is used. While the Medical Department consists of officers of the Medical, Dental, Veterinary, and Medical Administrative Corps, this is a technical school and the course will provide primarily for the training of medical officers. However, until other facilities are provided for them, officers of the Veterinary and Dental Corps will be considered eligible for special laboratory and other courses to be conducted in this school. Eventually the Medical Department will maintain a technical school for each of its major services, such as an Army Dental School, an Army Veterinary School, and an Army Nurse School; in addition to the existing Army Medical School.

(e) The standard basic course in technical subjects (1) is primarily conducted for medical officers of the Regular Army who have entered the service as commissioned officers since the beginning of the preceding course and who have satisfactorily completed the basic course at the Medical Field Service School at Carlisle Barracks, Pa., and for selected officers of the National Guard and Reserve Corps. It has as

its object what might be characterized as a post graduate study of the following subjects in their application to military conditions: Bacteriology, Parasitology, and Preventive Medicine; Sanitary Chemistry, Nutritional Chemistry, Clinical and Operative Surgery, Clinical Medicine, Ophthalmology, and Roentgenology. (All clinical work is given at Walter Reed General Hospital, Takoma Park, D. C.)

(f) The special advanced (post-graduate) courses (2) are maintained for selected medical officers who desire to undertake post-graduate work or make an intensive study in any professional specialty, including any of those subjects mentioned above. Students for the advanced courses will be selected for their special fitness for the particular subject or subjects they are to pursue. As these courses will be highly specialized, and as they will require a student's full time, each officer will as a rule be detailed to take but one of them during a given session.

(g) As the courses in professional subjects given at the Army Medical School are similar to those offered by civilian post-graduate medical schools, the advanced courses are open only to medical officers of the Regular Army.

Medical officers of the National Guard and Reserve Corps who enroll for the standard basic course will be required to take the full course.

(h) A pamphlet giving all the details concerning the administration, courses, etc., of the Army Medical School will be published in the near future as part of the new Army Regulations now in process of preparation. Calls for copies of these pamphlets should not be made, however, prior to July 15, 1921.

(i) All applications for permission to take any of the courses outlined in this schedule should be forwarded at least two months prior to the opening of the course. Each application should specifically cite the course desired and its inclusive dates as given in the schedule, and include the age of the applicant, a brief statement of his previous military experience and any training courses he has previously followed.

(j) The reservations for National Guard Officers for the standard basic course (1) will be handled by an allotment to the Chief of the Militia Bureau. All applications for members of the National Guard for permission to take that course should be forwarded through military channels (i.e., National Guard) to the Chief of the Militia Bureau, War Department, Washington, D. C. If the number of National Guard applicants for that course exceeds the reservations made, the Chief of the Militia Bureau will decide as to how the attendance shall be apportioned.

(k) The reservations for Reserve Officers for the standard basic course will be handled by an allotment to Corps Area Commanders, a distribution as equitable as possible being made to each Corps Area. Application for members of the Reserve Corps for permission to take the course should be forwarded to the Commanding General of the Corps Area in which the applicant resides. If the number of reserve applicants for this course exceeds the reservations allotted, the Corps Area Commander will decide as to how the attendance shall be apportioned.

(l) All applicants on the active list will forward their applications through military channels.

INTERESTING STATISTICS

We print the following statistics as a matter of general interest to the profession, and in line with others which have appeared in former issues of *THE MILITARY SURGEON*:

TOTAL NUMBER OF CASUALTIES IN THE BRITISH ARMY DURING THE LATE WAR
(ALL RANKS—ALL ARMS—ALL THEATRES). Up to Jan. 1, 1921.

(N.B.) General Goodwin states that these figures include casualties from post-armistice fighting in the East, which are not final, hence these figures should not be regarded as absolutely accurate. They may be regarded however as approximating closely enough to fact to be of use in computation.

Regular army territorial force and royal naval division	Killed in action and missing, now presumed dead up on lapse of time.	Died wounds	Died from other causes	Total deaths	Wounded	Missing (deaths not yet presumed)	Total
	474,254	139,664	69,912	683,830	1,668,573	143	*2,352,546
Dominion and Colonial contingents, . . .	94,889	30,845	14,063	139,797	357,235		497,032
Indian and native African troops . . .				61,398	70,859	2,560	134,817
African followers, . . .				11,787	1,327	764	46,878
Total	569,143	170,509	83,975	929,812	2,097,994	3,467	3,031,273

*Includes Royal Flying Corps to March 31, 1918.

TOTAL CASUALTIES IN THE ROYAL ARMY MEDICAL CORPS

Regular army and territorial force,							
	3,181	1,429	1,887		17,007		23,504

STATEMENT OF LOSSES IN THE FRENCH ARMY DURING THE EUROPEAN WAR

- (1) Killed in action: 674,000 counted on the battlefields, 252,000 missing.
- (2) Died of wounds—250,000.
- (3) Died of disease or other causes—175,000.
- (4) Wounded—3,025,613 including the evacuated and non-evacuated treated in the sanitary formations up to discharge or decease.
- (5) Mortality in the Medical Corps:

From the effects of wounds,	887
From the effects of disease,	573
- (6) Unable to serve as a result of wounds or disease.

We are as yet lacking in the figures to establish an exact statistical statement of this category.

DESCRIPTION OF A SANITARY STAND FOR GARBAGE AND WASTE PRIOR TO DISPOSAL

As used at the Convalescent Hospital, A.F.G.

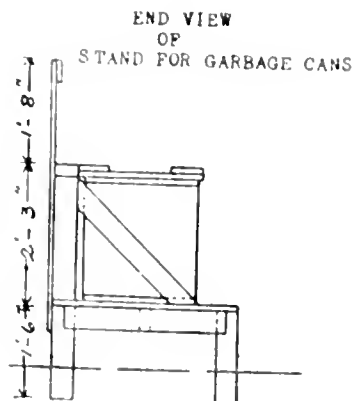
By MAJOR HENRY P. CARTER, M.C., U. S. ARMY

(One illustration)

A sanitary stand for care of garbage and waste prior to collection has been used at the Convalescent Hospital, American Forces in Germany, for more than a year with considerable success, and a brief description of the stand and the methods of keeping it in efficient operation may be appropriate.

As noted by the accompanying illustration it will be seen that the stand consists of a wooden, slatted platform on 4 x 4 uprights (specifications Fig. 1) about eighteen inches above the ground surface. The platform is three feet four inches wide by twelve feet six inches long and is so constructed as to accommodate five of the standard size garbage cans in common use at various Army Posts.

The distinctive feature of the stand is the automatically self-closing wooden covers, each cover (lid) being protected on top against rain with zinc sheeting, thus reducing the chance of warping. At a height of two feet three inches above the floor of the platform a two by four piece of lumber extends across the back of the platform supported on braced uprights and to this part of the back frame are attached the hinged covers, each cover having three six-inch heavy wrought iron strap hinges.



List of material used to build stand.

Lumber.	
8 - pcs.	4"x4"x1'-6"
4 - pcs.	2"x4"x12'-6"
2 - pcs.	2"x4"x3'-0"
4 - pcs.	2"x4"x2'-0"
2 - pcs.	2"x4"x2'-10"
1 - pc.	1"x4"x10'-0"
3 - pcs.	1"x4"x4'-3"
5 - covers	2'x2'-1"
30 - pcs.	1"x6"x2'-0"
Floor --	
1" lumber	12'-6" X 3'-0"
	37½ sq.ft.
15 - Hinges	6" strap
100 - Nails	6d
40 - "	20d
30 - Screws	1½"

Fig.1— Specifications of Stand.

Brass hooks and eyelets are provided for each lid, which when fastened together, hold the lid up against the top piece of the back frame during the time the cans are being emptied or the stand is being cleaned.

Attractively painted signs are attached to the front edge of each lid, designating the proper separation of the garbage and waste. It has been found that these swinging signs safeguard to a certain extent the hinged cover, inasmuch as they reduce the amount of rough handling to garbage can covers of this type.

The advantages of this type of stand are that it is open, easily cleaned, and its good appearance creates a favorable impression. The contents of the can are protected against flies, rats and dogs and the hinged covers are to be found always in place.

The disadvantages of the use of this stand are very few, the principal ones being the difficulty in keeping the hinges well secured and prevention of warping of the lumber pieces which go to make up the stand. Careful supervision, however, easily overcomes the difficulties.

PUBLIC HEALTH AND THE SUBMERGED CLASSES

That more than 75,000 men, women, and children out of a total population of 783,000 are dependents, delinquents, or feeble-minded and are unable either to work or fight and are a constant drain on the finances, health, and morality of the State is the startling result brought out by a survey conducted in Oregon. Moreover, more than 500 school children out of a total school enrolled population of 32,500 were found to be more or less mentally deficient, a fact which is of much significance when it is remembered that the condition of the children of today is the best possible index to the condition of the community of tomorrow and indeed to the future of the race.

The figures yielded by the Oregon survey are considerably lower than the average shown by the draft examination, a fact that indicates, in the opinion of the U. S. Public Health Service officers, that they are certainly not higher than those that would be obtained by similar surveys in other States. It is considered greatly to Oregon's credit that it has been one of the first States to realize the importance of the problem and to take effective steps toward ascertaining the exact facts concerning it.

The survey was authorized by the Oregon legislature and was carried out by the University of Oregon in collaboration with Dr. C. L. Carlisle of U. S. Public Health Service.

"The making of the survey," said Surgeon General H. S. Cumming, "was not an easy task, for in Oregon, as in many other States, comparatively few of the types involved are being cared for in institutions. The rest are widely scattered and were practically unknown, for most of them are quiet and do not attract attention as do the insane and criminal. It was therefore necessary to build an organization to find them and report on them.

"As there was little money to pay trained workers, Dr. Carlisle enlisted volunteers, largely among the professional classes in every part of the State, and, through these, found the people sought and collected data concerning their behavior, present history, school history, social relations (whether dependent, delinquent, or feeble-minded), the cause of their condition, and so on.

"The prevention and correction of mental defectiveness," went on the Surgeon General, "is one of the great public health problems of today. It enters into many phases of our work and its influence continually crops out unexpectedly. For instance, recent studies made in connection with the spread of venereal diseases have shown that feeble mindedness is an important factor in prostitution. Again, work of the U. S. Public Health Service in connection with juvenile courts shows that a marked proportion of juvenile delinquency is traceable to some degree of mental deficiency in the offender.

"For years Public Health Officials have concerned themselves only with the disorders of physical health; but now they are realizing the significance of mental health also. The work in Oregon constituted that first State-wide survey which even begins to disclose the enormous drain on a State caused by mental defects."

One of the objects of the work was to obtain for the people of Oregon an idea of the problem that confronted them and of the heavy annual loss, both economic and industrial, that it entailed. Another was to enable the legislature to devise a program that would stop much of the loss, restore health, and bring to lives of industrial usefulness many of those now down and out, and, above all, to save hundreds of children from growing up to lives of misery.

ARSPHENAMIN ASIDE FROM SYPHILIS

The discovery of the spirillum of relapsing fever by Obermeier in 1873 was the starting point of what was probably the most important work in parasitic diseases, that of Schaudinn, Wasserman, Ehrlich, and others in relation to syphilis.

The demonstration of this spirochete was followed by that of others of the same essential type and through their study Ehrlich developed the treatment which he hoped might prove for lues the "*therapia sterilisans magna*." The completion of the circle, certainly not a vicious one in this instance, lies in the fact that the remedy evolved for another disease should prove efficacious in the treatment of the condition caused by the first organism.

Although the direct and primary object of arsphenamin was the abatement of syphilitic disease, experience showed that it was effective in the treatment of other non-luetic conditions.

Dr. Louis Boëz in a monograph written in 1918¹ reviews in an interesting manner the therapy of relapsing fever with "606" and "914" and quotes sixteen cases which came under his personal observation in Macedonia in 1916-17.

He refers to the lack of success which Mantenfel had with vaccinothrapy, the barren results of experimental serotherapy in the hands of Novy and Knapp,² the ineffectiveness of methyl blue, quinine, the mercurials and even the less complex arsenical products such as Fowler's solution, the cacodylate, etc., and the very striking benefits from intravenous injection of arsphenamin. In addition to his own experience with this drug he cites the results obtained by others: a series of 52 cases treated in 1910 by Iversen at St. Petersburg with only 18 relapses and an instructive series reported by Bitter and Dreyer³ in which two series of cases were treated, one symptomatically with many relapses, the other with arsphenamin with no relapses. Boëz discusses in detail the administration of arsphenamin in relapsing fever, taking up symptomatology and dosage, and concludes that in this disease this remedy is as near a specific as anything in the field of materia medica.

Reasoner and Nichols discuss at length⁴ the treatment of nonsyphilitic diseases by arsphenamin and in what they write there is, in addition to positive clinical results, the suggestion of further advance in affections which have so far proved refractory to the administration of this form of organic arsenic. While admitting existing differences in the morphology of certain of the spirochetes, they consider that the similarity is sufficient to justify placing them in a single group and they tabulate eight, in order of pathogenicity, from *Spirocheta plicatilis* the least toxic, to the *Treponema pallidum* as the most virulent. They reserve judgment as to whether the spirochetes should be classed as bacteria or protozoa and are of opinion that, for the present at least, they may be considered as forming an intermediate group. They consider, as do other investigators, that the mechanism of therapeutics with this class of infecting organisms is a chemotherapy, a true chemical affinity between the remedy and the organism itself, and that on this ground there is more reason to expect favorable results from the administration of arsphenamin to those in spirillary diseases than in protozoal or bacterial infections. That this is not absolute, however, is demon-

¹ Louis Boëz, "Contribution à l'étude de la Chimiothérapie de la Fièvre Récurrente par le Novarsenobenzol," A. Maloine et Fils, Paris, 1918.

² Novy and Knapp, *Bull. de Inst. Pasteur*, Paris, Vol. IV, No. 6.

³ Ehrlich and Hata with contributions by Nichols, J. Iversen, Bitter, and Dreyer. "The Experimental Chemotherapy of Spirochoses," Berlin, Julius Springer, 1910.

⁴ M. A. Reasoner and H. J. Nichols, "The Use of Arsphenamin in Nonsyphilitic Diseases," *Jour. A. M. A.*, 75, 645. September 4, 1920.

stated from the experience of Bettman, Laubenheimer⁵ and others in the treatment of anthrax. They demonstrated in experiments with rabbits that immediate injection with arsphenamin will prevent a fatal result in a lethal dosage of anthrax. Even this may be an indication that there is a field for the utilization of the organic preparations of arsenic in diseases other than those of spirochetal origin. Among spirillary diseases, not all are amenable to arsphenamin treatment, some seeming so far to be entirely unaffected by this form of medication. While Noguchi has demonstrated that the causal agent of yellow fever is the *Leptospira icteroides* and that an arsphenamin solution of 1:200,000 will destroy this, *in vitro*, after two or three days contact, experimental work with animals susceptible to the poison has as yet been negative in result. No extensive work along this line has, however, been carried out and it is possible that further research may demonstrate a degree of usefulness for arsphenamin in the disease.

In summing up, Reasoner and Nichols state that the beneficial effect of arsphenamin and neo-arsphenamin is limited to a certain number of spirochetal diseases and that it is apparently a specific in Vincent's angina, relapsing fever, yaws, gangosa and pulmonary spirochetosis (in the early stages) in man, and in equine influenza. The beneficial action of arsenic has for some time been recognized by the dental profession in Vincent's angina, or "Trench mouth," and they have successfully treated it by topical application of Fowler's solution, which however, in the necessary concentration, is less safe than local application of arsphenamin and no more reliable.

Aside from the beneficial action in the diseases mentioned, good results have been obtained in syphilitics where non-syphilitic conditions, adversely influenced by the luetic condition, were benefited.

It is probable that further investigation and experiment may extend the sphere of usefulness of a remedy which at the present time is not given serious consideration by many outside of its application to syphilitic conditions, and it is possible that its range may be increased to embrace some of the protozoal and bacterial diseases.

WATER PURIFICATION FOR TOWNS ON RIVERS

The method by which Uncle Sam, acting through the U. S. Public Health Service purifies the drinking water for his model hospital village and reservation at Perryville, Md., though not altogether new, carries some interesting lessons for the country at large and particularly for towns situated along tidal rivers.

The raw water, which is pumped from the Susquehanna River through 30-inch mains to settling tanks, is subject to rapid changes in turbidity ranging from 10 to 100 parts per million; and the amount of aluminum sulphate to be added as a coagulant and precipitant must be varied to suit. Samples of the water entering the mains are taken every two hours; and the amount of coagulant to be added is determined by the chart based on the amount of water and its turbidity; for instance 0.6 grain of the alum is added for 10 parts per million of turbidity. This amount, however, is also governed by the alkalinity, which may vary greatly during the day; when it drops below 14 parts per million, soda ash is added.

Two hours are allowed for settlement in the tanks, after which the water flows by gravity through mechanical rapid sand filters, passing through three feet of sand and eight inches of stone and gravel at the rate of two inches in 55 seconds. Later, the water is treated with liquid chlorine, the amount depending on bacteriological examination of the raw and the chlorinated water. This treatment reduces the

⁵ Bettman and Laubenheimer: *Deutsche Med. Wchnschr.* 38, (Ueberev.) 22 1912.

bacteria from an average of 2,630 (maximum 7,860) per cubic centimeter to less than one.

The condition of the water at Perryville is affected by the geological formation of the country, by the daily conflict of the tide and the river current, and by the strong winds which often cause terrific wind action on the low flats, all of which necessitate very effective treatment.

Ohio has the honor of possessing the first Medical Regiment—the 112th—which has been completed in the National Guard. It is commanded by Colonel H. H. Snively, who has been prominent in the Medical Department of the National Guard for many years and who had a long and varied experience during the World War. In 1914 he went to Russia and was appointed a Brigadier General in the Medical Department of the Russian army. He later returned to this country and served with the Ohio troops in France, and after the Armistice went to Poland with the American Relief Expedition commanded by Lieut. Col. H. L. Gilchrist, M. C.

Shortly after his return home in 1920, Colonel Snively took up the work of reorganizing the Medical Department of the Ohio National Guard, and the early completion of the Medical Regiment allotted to the State is the result of his efforts.



BOOK REVIEWS

AIR SICKNESS: ITS NATURE AND TREATMENT, by René Cruchet, Professor of Medicine in the University of Bordeaux, and René Moulinier, Naval Surgeon, sometime Professor of Naval Hygiene in the University of Bordeaux. With a Preface to the French Edition by Dr. V. Pachon, Professor of Physiology in the University of Bordeaux, and an Introduction to English Readers by Wing-Commander Martin Flack, M.B. Translated from the French by J. Rosslyn Earp, M.A., M.R.C.S. Published by William Wood & Co., New York, 1920. Price \$1.50.

This small volume contains chapters on The Physiology of Flying, The Nature of Air Sickness, Training and Overwork in the Airman, The Hygiene of the Airman, and The Principal Contra-Indications to Flight. The introduction to English readers is written by Wing-Commander Martin Flack, C.B.E., M.A., M.B., Director of Medical Research, Royal Air Force, who gives a comprehensive view of the importance of this work and shows the wide field which is opening for additional research on the medical problems of flying. He says:

"To a far greater extent than is generally realized, a successful future for aviation depends upon the mental aptitude and physical fitness of the personnel engaged in flying. Investigation has shown that many flying accidents are due to what may be called the human element. For this reason, it is imperative that special methods shall be employed in the selection and care of the airman. Not only must the candidate for aviation possess the necessary mental aptitude, but he must also have the potential ability to acquire the mechanics of flight. Furthermore, he must also be endowed with resistance to the fatigue, both bodily and mental, necessarily associated with learning to fly, with flights of long duration, and with flights at high altitudes.

"Given proper selection, the medical care of the flier is therefore largely preventive. It is the duty of medical officers to watch over their flying personnel, to see how pilots are withstanding the effects of flying, and to take proper steps to combat at an early stage the onset of flying stress, and to mitigate its effects. For this reason periodic medical examination, as required by the International Aeronautical Convention, is a necessity. It is important, therefore, that medical officers shall be thoroughly cognizant, not only of the methods employed in their own country, but also of those in use in various other countries. They should also be acquainted with the progress of research into the various medical aspects of aeronautics. On this account the publication of the valuable work of their French colleagues is particularly opportune at the present time.

"There is still a wide field of investigation open to medical officers interested in flying; such work will do much, not only to further medical knowledge but also to advance the success of aviation both military and civil."

ALBERT E. TRUBY.

THE AMERICAN YEAR-BOOK OF ANESTHESIA AND ANALGESIA, 1917-1918. (Copyrighted January, 1921.) F. H. McMechan, M.D., Editor. Large Quarto, Bound in Art Buckram and Printed on Natural Tint Paper. 471 Text Pages, 175 illustrations. Containing a Cumulative Index of the Pertinent Literature for 1917-1918 and Contributions by Eighty-four Eminent Authorities. Surgery Publishing Co., Publishers, 15 East 26th St., New York City. Price \$10.

The American Year-Book of Anesthesia and Analgesia (Copyrighted January, 1921), covering the advances in these subjects during 1917-1918, is just at hand.

Delayed in publication by the World War, it contains those methods of anesthesia and analgesia introduced to expedite military surgery, which are to find a place for themselves in civilian practice for the benefit of all concerned.

The Year-Book, as a cumulative encyclopedia, provides the anesthetist, specialist, surgeon, dentist, research worker, and hospital superintendent with those special advances that meet their individual requirements.

Fundamental studies in the pharmaco-physio-pathology of anesthesia and analgesia, of exceptional merit, have been included and as many of them have a direct bearing on the clinical handling of patients submitting to operations under narcosis, they are doubly significant and valuable.

Aside from a series of contributions on complicating and safety factors of anesthesia, acidosis, blood changes, blood pressure variations, pharmaco-physio-pathological studies both in general and local anesthesia, and methods of technic, especially those developed in war surgery and the newer methods of local analgesia in surgery dentistry and the specialties, the Year-Book contains a Cumulative Index of the Pertinent Literature for 1917-1918 which is invaluable to anyone making a study of any phases of these subjects and needing the necessary bibliography for reference or teaching.

THE MEDICAL INTERPRETER, a Digest in Four Numbers. Albert Alleman, A.B., M.D., Chief Editor.

This work has for its object the epitomization of advances in medicine and surgery, arranged in dictionary order for ready reference by those who are too busy to read the various journals which chronicle discoveries and new theories. The excerpts comprise not alone what is published in the English speaking countries, but also what is put forth in the foreign journals, thereby in a measure making up for deficient knowledge of other languages. Dr. Alleman, the Editor in Chief, is principal assistant librarian of the Library of the Surgeon General of the Army, and in his position has unusual opportunity to excerpt what is new and of value from current medical literature. We note on the title page, as collaborators, the names of Captain J. S. Taylor, Medical Corps of the U. S. Navy and in charge of the Division of Publications, Asst. Surg. Gen. J. W. Schereschewsky of the Public Health Service, E. M. Salmonsens of the John Crerar Library of Chicago, as well as other well-known names. In addition to the alphabetic arrangement of the subject matter, this is further catalogued on each page as belonging to the province of medicine or surgery. The book is well gotten up and contains appropriate illustrations.

THE CONTROL OF SEX INFECTIONS. J. Bayard Clark, M.D., F.A.C.S. New York City: The Macmillan Co., 1921.

This little work of some one hundred and thirty pages is designed for the use of Social Workers, Public Health Leaders, Public Health Nurses, and for the consideration of parents in the question of sex education of children. Dr. Clark deals with this old and always difficult question in a straightforward and interesting manner, and advocates what has long been a desideratum, the frank consideration of what has always been a "hush" topic. In the various chapters he discusses the causes of sexual diseases, the knowledge gained through war statistics, the prevention of these infections, the question of instruction of children, the importance of universal training in such matters, and the value of systematic care of those infected. Aside from other advantages, Dr. Clark had service during the World War and the benefit of that experience to draw on. The book is practical and should be of interest to those for whom it is written.

THE BASIS OF PSYCHIATRY. (Psychobiological Medicine.) A Guide to the Study of Mental Disorders for Students and Practitioners. By Albert C. Buckley, M.D., Medical Superintendent of Friends Hospital, Frankfort; Associate Professor of Psychiatry, Graduate School of Medicine, University of Pennsylvania; Alienist to the Philadelphia Orthopaedic Hospital and Infirmary for Nervous Diseases. 79 Illustrations. Philadelphia and London: J. B. Lippincott Company. Price \$7.00.

Doctor Buckley offers to the profession a very complete and conveniently arranged treatise on psychiatry. His method of approach to the subject is through the channels of biology, and he consistently follows this mode of presentation throughout the book. In the opinion of the reviewer this is a refreshing change from the pedantic methods heretofore in vogue. Part I is devoted largely to the presentation of biological phenomena, psychological processes, etiologic factors, symptomology and methods of examination, etc. In Part II the author considers in detail the various types and groups of psychoses. The illustrations and diagrams are ample for the purpose.

FRANCIS M. MUNSON.

ATLAS DE SYPHILIMETRIE, by Dr. Arthur Vernes, Directeur de l'Institute Prophylactique de Paris.

This interesting volume is an explanation of the author's system of controlling the treatment of syphilis, or "the measurement of syphilis," by the blood serum reaction devised by him. The presence of this reaction, which he claims is the most constant, most definite, and most persistent of the signs of syphilis, is an indication for specific treatment, and the complete disappearance of the reaction over a period of time is assumed to be proof of cure. The volume contains over one hundred graphs and charts showing the decrease and final disappearance of the reaction under appropriate specific treatment in the author's cases.

The author's reaction by which he "measures" the degree of syphilitic infection is essentially a colloidal reaction, depending upon the flocculation or non-flocculation of human serum by an organic colloidal preparation. This organic colloidal preparation used as a flocculant has been named "perethynol" by its discoverer, is made from horse heart, and is somewhat harder to prepare than the reagents used in the Wassermann test. As it was impossible to directly read this flocculation it was necessary to employ a colloidal reaction of a different nature but depending upon flocculation. This was achieved by using pig serum, which plays a double rôle, being both a hemolysin and an anti-flocculant. In the author's words, "Let one imagine a substance which has the power of opposing flocculation (anti-flocculant) and at the same time the power of producing hemolysis (hemolysin), but which loses its hemolytic property in direct proportion to the utilization of its anti-flocculant property. Several substances are capable of playing this double rôle but notably pig serum." The patient's serum is mixed with pig serum and the organic colloidal suspension "perethynol" and incubated at 37° C. for one and one-fourth hours. Sheep cells are then added, the tubes incubated for thirty minutes and then centrifuged.

With a positive syphilitic serum, the pig serum in the first phase of the reaction prevents the flocculation which occurs only with syphilitic serum. The pig serum thus loses its hemolytic property in direct proportion to the utilization of its anti-flocculant property. With a normal human serum there is no flocculation, no utilization of the anti-flocculant property of the pig serum, and, therefore, no loss in its hemolytic power. The sheep cells are added as an indicator of the remaining hemo-

lytic activity of the pig serum. The results are shown as a series of color tints varying from bright red in normal serum to a complete absence of color in positive serum, the changes occurring in eight degrees, "0" being considered as strongly positive and "8" being completely negative. Interpretation is thus seen to depend upon the degree of hemolysis, and thereby introduces the same difficulty in reading and interpreting as the Wassermann test.

Although Vernes as early as 1913 vouched for the reliability and specificity of the reaction, no one since then has definitely confirmed its value, probably due to the involved and laborious technique necessary in the preparation of the reagents and the actual performance of the test. It is possible that the phenomena of Vernes will prove to be a useful adjunct in the diagnosis and control of syphilis in the same degree that the colloidal gold reaction is useful as an adjunct to the Wassermann test on the spinal fluid, but it seems doubtful that the reaction of Vernes will ever supplant the Wassermann test.

The volume is well printed, the graphs and charts being especially good, and the text is extremely interesting, but the volume is of an awkward shape and will be difficult to fit into any book-case or shelf.

Atlas de Syphilimétrie. Les Conditions expérimentales de l'extinction de la Syphilis. By Arthur Vernes, Directeur de l'Institut Prophylactique de Paris. Imprimerie A. Pradier, P. Boll, successeur, 12 rue de Bourdonnais, Paris.

W. C. WILLIAMS.



J.W. Kent

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JOHN WALTER KERR

SURGEON John Walter Kerr was born at Grand Rapids, Ohio, December 4, 1871. His parents, William Barton Kerr and Jane Culbertson Kerr, were of Scotch-Irish ancestry who had settled in the Maumee Valley of Ohio in an early day. His boyhood was spent on the homestead farm where he was born, and his education was begun at the Grand Rapids public schools, from which he graduated in 1887.

He then continued his literary education at Westminster College, and later entered the Medical Department of Western Reserve University, from which he received the degree of Doctor of Medicine in 1897. During his last year in medical school he was elected president of his class by his associates and designated by his professors as demonstrator of anatomy. Just prior to graduating he took the prescribed examination and received appointment as Interne in Lakeside Hospital, Cleveland, Ohio, but on account of delay in opening the new hospital this service was not completed, private practice being taken up instead in Logan County, Ohio.

After about a year's practice Doctor Kerr passed the examination of candidates for entrance into the Public Health Service, and was commissioned an Assistant Surgeon by the President, December 23, 1898. He was the third member of his family to enter the public service within a hundred years, his father having been a veteran of the civil war and his great-grandfather a soldier in the war of 1812.

His first station was the U. S. Marine Hospital, San Francisco, California. On account of outbreaks of smallpox among troops returning from the Philippines, however, it was necessary soon to detach him, and on May 3, 1899, he joined the U. S. Quarantine Station, Angel Island, California.

The transports *Grant* and *Sherman* were then in quarantine on account of smallpox aboard, and later the 31st and 48th regiments, en route to Manila, were received at the quarantine station for like cause. As boarding officer at the station, he took part in the sanitary inspections of all the volunteer state troops returning from the Philippines, as well

as passengers and crews arriving on merchant vessels. Opportunity was thus early afforded him to become familiar with quarantine practice.

Immediately following the discovery of plague in the Chinese quarter of San Francisco in March, 1900, Doctor Kerr was assigned to duty in connection with suppressive measures. These having been suspended by official order, and a plague epidemic of unusual proportions having broken out in South China, he was detailed by the President, May 7, 1900, for duty in the American Consulate at Hongkong, to prevent the spread of the disease to the Philippine Islands and to ports in the United States. On account of the imminent danger to Hawaiian Ports also, he called at Honolulu en route, and familiarized himself with quarantine conditions there in relation to trans-Pacific commerce.

While in Hongkong, Doctor Kerr observed three severe epidemics of plague, two of cholera, and outbreaks of smallpox, typhus fever, and leprosy. After almost three years of arduous duty in enforcing the foreign quarantine regulations of the United States at that port, and in studying sanitary conditions in South China in relation to commerce to the United States, he was ordered to return home via Suez, and arrived in New York February 2, 1903.

At that time a severe outbreak of plague had just been reported at Guaymas, Mexico. In consequence, he was immediately detailed as inspector along the Mexican frontier. This duty concluded, he returned to New York May 28, 1903, and took part in medical inspections of immigrants. This same duty was performed successively at Ellis Island, N. Y., Duluth, Minn., Quebec, Can., and St. John, N. B., until December 17, 1905, when he was ordered to the Bureau. In the meantime he had been promoted to the rank of Passed Assistant Surgeon and commissioned as such by the President, December 31, 1903. While at Ellis Island, part of his service was performed in the Immigrant Hospital, of which he had charge under the direction of the Chief Medical Officer.

On reporting at the Bureau at Washington, Doctor Kerr was placed in charge of the Division of Scientific Research and made Assistant Surgeon General, which position he occupied until 1918. In this capacity he had administrative supervision over the several laboratories and field investigations of the Service, and handled the scientific reports in the Bureau until their issue in published form. He has made special studies of Public Health subjects, and is the author of several official bulletins on tuberculosis, "certified milk," infants' milk depots, and rabies. In addition, he has analyzed the laws of the several States and territories relating to communicable diseases, vaccination, ophthalmia neonatorum, common drinking cups and roller towels, and organ-

ization, powers, and duties of State and local health authorities, and is author or joint author of bulletins containing these analyses.

During Doctor Kerr's tenure as Chief of the Division of Scientific Research of the U. S. Public Health Service, and as a result of his efforts, investigations of infectious and other diseases by the Division under his control were extended and expanded in a remarkable manner. At the beginning of his duties the appropriations at the disposal of the U. S. Public Health Service for medical research were pitifully small, but at the end of his detail they had reached very respectable proportions. It was during Doctor Kerr's tour of duty at the Bureau that Goldberger's epoch-making work in Pellagra was carried on. Without the continued and generous support which Doctor Kerr gave this work it could not have been pushed to the successful conclusion to which it was carried.

Men engaged in scientific research were always assured of his unswerving support and deep and sustained interest in their projects.

Doctor Kerr's judgment of men and of measures was well-nigh unerring. He had especially well developed, not only the faculty of clearly seeing the most important fields of investigation, but of clearly outlining the nature of the attack that should be made on the individual problems. His long experience in field public health work uniquely fitted him to judge of the "worthwhileness" of research measures. In addition to his work at the Bureau Doctor Kerr was called in consultation in turn by the States of Massachusetts, Kansas, and New Mexico when these Commonwealths were engaged in revising their public health laws and reorganizing their health departments, and it is a tribute to his soundness of judgment and breadth of view that his recommendations were accepted in each case, almost without exception.

By reason of his position in the Bureau, Doctor Kerr has acted as secretary of the annual conferences of State and Territorial Health Authorities with the Public Health Service, and of the meetings of the Advisory Board of the Hygienic Laboratory. He was secretary of the section on State and Municipal Control of the International Congress on Tuberculosis, at Washington in 1908, and secretary of the section on the Hygiene of Traffic and Transportation of the Fifteenth International Congress on Hygiene and Demography, held at Washington September, 1912. He has represented the Public Health Service in a number of other important meetings, and is the author of several public health papers published in unofficial publications.

After twelve years of duty at the Bureau Doctor Kerr was relieved and assigned to duty as Chief Medical Officer at the U. S. Immigration Station, Ellis Island, New York. The outstanding feature of his

service there was an inspection trip throughout Europe during the latter part of 1920 and the early part of 1921, in company with the Commissioner General of Immigration of the United States, the purpose being to determine a desirable policy for the United States with respect to immigration under post-war conditions.

Besides his membership in the University Club of Washington, Doctor Kerr is a member of the American Medical Association, the American Public Health Association, the Association of Military Surgeons, the Association of Medical Milk Commissions, and the International Union for the Protection of Infant Life.

Doctor Kerr has been a member of the Association of Military Surgeons for many years and has held various official positions in the organization; at the meeting held in New Orleans in 1920 he was honored with election to the Presidency of the Association.

Doctor Kerr is a firm friend, a genial companion, and in every respect a delightful gentleman.



PRESIDENT'S ADDRESS¹

SOME INFLUENCES OF THE WORLD WAR ON THE FUTURE OF NATIONAL HEALTH

SurG. J. W. KERR, U.S. P.H.S.

IN accordance with time-honored custom, it becomes my pleasant duty to review the recent activities of our Association and to touch on its future as related to medico military preparedness. It is fitting also to pay tribute to those of its members who have contributed to the objects for which it was established, and who within the year have finished their work and passed away.

In the death of General Gorgas our profession has sustained a severe loss, but the world inherits an exemplar of high mark, for his work has added much to the expectancy of life and will continue to do so in time to come.

Others less eminent in the Association have likewise finished their work within the year, the objects of which were service of country and humanity. While they were permitted to live and serve during a momentous period, it was not given to them to see the end results of these labors performed in unison with millions of others.

Those of us who remain are in duty bound to profit by their labors, to strive for better organization of the branches of government we represent, and to promote more through cooperation both in peace and in war. These are the avowed objects of our Association, as set forth in its constitution.

During the past year the Association has held its own in point of numbers, its finances remain in healthy state, and its scientific work has been advanced. These results are due in large measure to the labors of the Secretary, Colonel Church, and his co-workers, who are deserving of high commendation for their zeal and faithfulness.

At no time has the field for usefulness of the Association been greater. Having sprung from the desire of great medico-military characters to perpetuate the enthusiasm, fraternalism and experiences of the Spanish-American war, it should serve also as a forum in which to clarify the medical and public health experiences had during the World War.

Within no period have weightier events transpired, nor have greater changes taken place than are likely to follow it. By reason of their magnitude these changes may be slow in manifesting themselves fully, but ultimately their effects on government and society are certain to be profound.

Regardless of any high object for which they may be waged, wars are

¹ 29th Annual Meeting, Boston, Mass., June 2-4, 1921.

invariably attended by famine and pestilence, and followed usually by prolonged periods of economic distress. In these respects the World War has been no exception, for the present generation through international conflict has not only mortgaged its own economic and social progress but that of generations to come.

While events are too recent to judge of their full meaning, the influences of some of them have already been felt. It is not too early, therefore, to take these into account as related to the future of public health and national defense.

EFFECTS OF THE WAR ON HEALTH AND DISEASE

While epidemics prevailed, their number and kind were less than in all previous wars. Knowledge of prophylaxis previously acquired and vigorously applied rendered dysentery, smallpox, and typhoid fever practically harmless. Whereas the death rate from typhoid fever in our army in 1898 was 14.83 per 1,000, in 1918 it was only 0.08 per thousand among the expeditionary forces. Antityphoid inoculations were undoubtedly the essential protective factor among troops, although national sanitation was powerfully contributory, since in Europe before the war the disease had become uncommon and in the registration area of the United States during the years 1900 to 1915, inclusive, the deaths from this cause had decreased from 35.9 per 100,000 to 12.5. Paratyphoids, on the other hand, increased among troops abroad. This, according to Widal and Courmont, is the greatest epidemiological fact resulting from the war, in consequence of which triple vaccines were extensively used.

During the years of actual hostilities, however, typhus fever was widespread. While the losses among armies could not compare with those of troops during the Napoleonic and Crimean wars, the aggregate number of deaths from this cause among civil and military populations combined probably exceeded all previous records during a like period. Since the war the disease has spread. In the city of Rotterdam in 1919, 210 cases occurred, and during the six months ended March 1, 1921, numerous ships arrived at New York with cases occurring among immigrants aboard.

Measles, meningitis, and epidemic pneumonia were likewise widely epidemic during the war. Unintentionally, the rapid assembling of millions of recruits in barracks in the United States, and sometimes their overcrowding, was a vast epidemiologic experiment. Their demobilization, however, was a triumph of sanitation. Whereas, Napoleon's army, on its return from the Egyptian campaign spread trachoma over Europe, and the Union Army after the civil war is said to have established malaria

endemically throughout the North, our expeditionary forces were returned from Europe without so far as known introducing any exotic disease in epidemic form, unless it be influenza.

The influence of the movement of vast numbers of soldiers and sailors on the origin of the pandemic of this last-mentioned disease cannot be known. But no plague of history approaches the experience of 1918 in number of lives lost within so brief a period of time. The complicating pneumonias largely responsible for this mortality have emphasized anew the futility of existing measures of prevention against the respiratory infections, with the exception of tuberculosis.

Among civil populations, however, with the exception of our own, morbidity and mortality from tuberculosis were greatly increased even in European countries not at war. Taking the mortality rates in certain European countries for 1913 at 100 per cent they were increased by 1918, in England and Wales to 125 per cent, in Holland to 142.5 per cent, in Spain to 132 per cent, in Alsace Lorraine to 132 per cent and in Prussia to 175 per cent. In greater Brussels during the same period the disease increased 118 per cent.

Venereal diseases were of course prevalent in all armies and unduly so in some, but there have been undoubted advances in control of these affections. Among the civil populations in warring countries of Europe they were varyingly increased. In Paris they were said to have doubled and in Belgium to have reached "frightful proportions."

With the view to ascertaining whether this increase was manifest among arriving aliens since the war, intensive examinations were made of representative groups of steerage passengers arriving at the Port of New York. Among 29,440 examined from February 13, 1921, to May 15, 1921, inclusive, a total of 124 were found to have gonorrhoea, chancroid, or syphilis in active form as verified by laboratory tests. This represents a total of 0.42 per cent. On account of the difficulty of thorough examinations among women, the percentage was slightly greater.

A like intensive examination of 11,794 steerage passengers during the fiscal year 1915 at New York had shown 0.31 per cent of venereal infection. Out of a total of 808 Wassermann tests of the blood of persons taken indiscriminately by a colleague at that time 2.5 per cent were positive. These figures indicate a low percentage of venereal infection among this class.

It should be borne in mind, however, that steerage passengers generally come from the peasant classes whose marital and social customs militate against infection. Furthermore, the conditions under which their travel is performed and the fact that they are subject to deporta-

tion if infected must tend to reduce the amount of infection among this class of arrivals.

The examinations for the draft, dealing with that portion of the population most liable to venereal infection, has thrown additional light on the incidence of these diseases in civil communities generally. Among a representative number of men examined in all sections of the United States 5.6 per cent were found infected.² It is safe to infer that the percentage among the whole population at any one time is very much less. Their decrease will be proportional to improvement of the morals of the people, which may be expected to improve as popular knowledge increases.

Fortunately, by reason of the war the public attitude in respect to venereal diseases has changed. Whereas, previously even educational measures were frowned upon, now enlightened public opinion encourages these and other measures of prevention.

Decreased consumption of alcoholic beverages will also markedly lessen the incidence of these and certain other diseases. Whether or not we approve the methods to bring it about, the enactment of law imposing nation wide prohibition is one of the outstanding results of the war. Its full effect on health and national vigor will be carefully watched by all thoughtful students of preventive medicine.

Independent of the infectious diseases, health and vigor of vast numbers of people have undoubtedly been undermined. Infant life abroad was adversely affected in numerous ways. Not only was the mortality increased in certain countries, but the birth rates were greatly decreased in all foreign countries at war. Furthermore, the growth of children in certain areas has been shown to be markedly retarded by causes long operative. What the ultimate effect will be on their subsequent development is it impossible to say. Among newly arrived immigrant children from devastated areas since the war, undernourishment has been evident and rickets unduly prevalent.

No appreciable increase of psychoses among immigrants has been manifest and they were probably not greatly increased in permanent form either among civilians or returning soldiers. From a public health standpoint however, the examinations for the draft have been significant. Like a sunbeam in a dusty room they have focused public attention on mental unfitness, although school inspections in large volume had previously indicated what might be expected. Over 39,000 school children specially examined in various counties by the Public Health Service showed about 10 per thousand to be feeble-minded. And of 11,000 children from the lower walks of life in certain institutions, over

² War Dept. Defects found among drafted men. 1920.

8 per cent were definitely feeble-minded and as many more mentally retarded. Such figures indicate in some measure the burden to society resulting from mental defect.

Whereas, previously the States and municipalities were largely confronted with the solution of this problem, the war has shifted the burden as relates to ex-service men to the Federal Government. The war did not cause mental defect nor, as stated, greatly increase permanent psychoses over what would have occurred, but it emphasized the need of their better care, and may bring about amelioration of their causes, which are exceedingly complex because bound up by the very life and development of the race.

Examinations for the draft have also focused public attention on physical unfitness. Examinations for industrial employment had previously indicated that an adult without blemish is the exception. Out of some 3,000 workers in a single trade examined by a colleague in New York in 1914, only two per cent could be thus classified, although the majority of the defects were of minor importance and did not interfere with civil occupations. The percentage of rejections during the draft on account of physical defects was very high, and the conditions giving rise to it are among the great health problems of the future.

On the whole, the war gave opportunity to take a cross section of the health of the male population and to apply on a large scale previously known sanitary measures. This work indicated also in no uncertain terms the value of universal training to the young manhood of the country.

While no great epoch making discovery in sanitation may have been recorded, the shortcomings of the past in respect to hygiene and the needs of the future were emphasized as never before.

UNPREPAREDNESS OF HEALTH AGENCIES FOR WAR

Among the civil populations within the two decades ended 1918, however, greater progress in sanitation has been made than in any similar period. In the registration area the death rate from tuberculosis (all forms) had been reduced from 201.2 per 100,000 in 1900 to 149.1 in 1918, and typhoid fever from 35.9 to 12.5. The death rate per 1,000 population under one year of age had been reduced from 131.7 in 1910 to 110.7 in 1918, and the expectancy of life at birth had been increased. In Massachusetts, the only State for which there were available life tables, the expectancy of life in 1897 was 45.4 years. According to the United States life tables it was 51.49 in 1910 in a larger selected area.

Trustworthy methods of laboratory diagnosis had been devised, preventive and curative serums and toxins established on a standardized

basis, food deficiency diseases elaborated, and the methods of transmission of other diseases such as typhus fever discovered. Finally, health organizations had been extended and the supervision of the health of school children and industrial workers established on a definite basis.

But no civil health agency, national, state, or local had taken into account long in advance the changed sanitary needs that would arise in the event of war, nor was any cooperative arrangement had with the military authorities to meet these needs.

War has become a titanic struggle between nations rather than armies. The work of at least five civilians is necessary to maintain one soldier at the front. Accordingly, all citizens should be required to make sacrifices insofar as possible proportionate to the soldier and sailor in the ranks.

Official agencies and industrial groups as well as individuals should have their duties specified in case of war, and social agencies should be conducted, under official aegis in greater degree than heretofore, so as to lessen waste and irresponsibility.

Development of plans for these purposes as relates to preparedness is the problem of the future. They should take into account the non-combatant portion of the population and all governmental agencies capable of contributing in any degree to national success. Had a permanent council of defense existed before the war to take into account the potential strength of the country, civil as well as military, and to devise plans to utilize it, there would have been less lost motion and greater opportunity for useful service on the part of both individuals and organizations. Perhaps the organization of new agencies within the Government, such as the food and fuel administrations, would have been unnecessary, and the beginning preparation of war gases in departments other than the military and naval obviated. Greater definiteness in respect to health protection would undoubtedly have resulted.

In war the fundamental activities of health agencies, federal, state and local, are bound to be increased. The value of these agencies as aids in winning wars will depend on the thoroughness of previous organization and training, and effectiveness of cooperation with the military and naval authorities.

Civil Health Problems During War

The special functions of civil health agencies must include coordination with one another; collection of public health data essential to the protection of health of both civil and military populations affected by war; the sanitation of ports and extra-military areas within the United States; sanitary supervision of the preparation and distribution of foods

and drugs and their standardization where practicable; laboratory studies for public health problems; sanitation of establishments manufacturing war materials; protection of child life; control of communicable diseases among civil populations and along lines of travel; sanitary supervision and care of refugees; and where necessary medical relief of dependents of those in the service of the country.

Health activities having no direct bearing on the immediate object to be accomplished should be held in abeyance. During the war, there was the tendency on the part of some to lose sight of relative values and to promote pet schemes rather than to safeguard the national life.

War is the grimmest business in which a people may engage. As in industry, team work is essential; every individual unit should accordingly be assigned to and be required to perform the duty either civil or military for which he is best fitted. By this means the serologist regularly preparing and standardizing serums and vaccines would not be required to stop and learn to dig trenches thousands of miles from the front, and the obstetrician would not be assigned to fumigate ships. The health officer of an important district, likewise, would not be permitted to desert his post, at least until it had been filled by another incapable, by reason of physical disability, of rendering other forms of public service.

THE ROLE OF HEALTH AGENCIES IN WAR

Had the war been long continued or our country invaded, a radical revision of policy, both on the part of civil and military medical authorities, would have become inevitable.

Either the care of the health of the country would have been assumed by the latter or the powers of the former would have been magnified and rendered absolute. It does not follow that health officers should not be liable to strictly military service. As individuals they should be if by so doing they may render greater service, but the decision as to character of service should rest with the President and his council of defense.

Health agencies, likewise, should be accorded their definite place in future plans for national defense, although they may not be actually incorporated with military or naval agencies. In the words of another:

War, by upsetting normal conditions, by markedly modifying normal channels of human travel and normal modes of life, and by subjugating all other considerations to military necessity, renders the duties of a health service more pressing in time of war than in peace.

The outstanding feature of all federal health laws is the intent to establish a permanent health agency which shall insure coordination with it of state and local health agencies and be available to meet

emergencies both in peace and in war. As a means to this end a public health reserve has been established as a part of the regular sanitary forces, which may be mobilized and utilized by the President as required in time of national peril.

Through a proper system of recruiting this corps properly includes among its members trained health officials and sanitarians. The health forces thus constituted should be relied on to work in closest cooperation with military and naval forces during war and be taught how to do so.

In fact, they should be a potential asset of these last-named forces to be drawn upon in emergency, and in return should receive accretions as might be necessary from among their reserves. The system of recruiting medical and sanitary reserves for the three Government reserves should be on a cooperative basis. By this means and the free interchange of officers, based on necessities and ability to perform specific duties, both the civil and military forces would benefit.

A further step toward efficient organization would be the proper affiliation of unofficial welfare agencies with the civil or military governmental forces, depending on the objects to be accomplished. Every agency and every individual should be considered solely from the standpoint of ability to perform useful service of a kind, and not to establish a record or to gain notoriety.

On account of the prevailing psychologic attitude during war this may be difficult if not impracticable, as relates to private agencies, but with governmental agencies it is essential to highest efficiency, and capable of accomplishment by means of laws which definitely fix their duties and relations to the business in hand. Servants of government in whatever capacity should find sufficient reward and satisfaction in performing these duties under definite assignment, particularly if they knew they were subject at all times to the call of the President for any service that might be required of them.

With Cappy Ricks they should be ready to say to him:

Everything I control, every dollar I possess is at the service of my country.

While the several branches represented in this Association undoubtedly can best serve through such training, organization, and utilization as shall be determined in their own governmental spheres, they should not be required to do so in ignorance of each other or in a spirit of unhealthy rivalry. The value of close coordination and mutual understanding is the outstanding lesson of the war. The essential object of the Association henceforth should be to devise means to bring these about. I believe it could perform no greater service.

THE ETIOLOGY OF SCURVY¹

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(Nine illustrations)

I. TECHNIQUE

THERE are certain generally accepted methods of procedure for the investigation of infectious diseases. Experimental investigation of the deficiency diseases is of more recent date, and no generally accepted plan of attack has been formulated. Yet in order to obtain information as to the nature of the dietary deficiency producing a certain disease, a well-defined method of procedure is no less necessary. Such a method may be described as follows:

1. Find a suitable experimental animal; i.e., one peculiarly susceptible to the specific deficiency and which therefore suffers from the disease after a short depletion period.

2. Use a diet complete with respect to other food elements, but which produces the particular disease with regularity in the chosen animal. Such a diet should contain not only protein, fat, carbohydrates, and salts, but a sufficiency of accessory food substances other than the one under investigation.

3. Find a food that prevents the disease when added to the above diet.

4. Find the minimum amount of this food necessary to confer protection.

5. Prepare extracts of this food that also confer protection. The non-essential elements of the protective food are then eliminated one by one, and when a sufficiently simple extract has been secured, the nature of the accessory food substance may be determined by chemical methods.

These rules seem quite simple, but many false conclusions have been drawn from experiments that ignored them. Thus McCollum was at one time led to conclude that scurvy was not a deficiency disease because, he says, (1) "It was impossible to harmonize the results described by Holst in the production of experimental scurvy in the guinea pig with those of McCollum, Simmonds, and Pitz, in which the rat served as the experimental animal." The rat, as is now generally known, does not develop scurvy when fed the same diet that produces scurvy in the guinea pig.

We owe our knowledge of the suitable experimental animal, as well as many other facts, to the basic investigation of Holst and Froelich.

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(2) These investigators not only showed that the guinea pig was susceptible to scurvy but that the disease was the same pathologic process observed in man, and like the disease in man, could be cured or prevented by the administration of fresh leaves, such as cabbage, and by certain fruit juices. More recent investigations have taught us much concerning the prevention and treatment of scurvy, including determinations of the relative amount of antiscorbutic substance in certain foods, and the effect on this substance of drying and cooking such foods; but we have learned little concerning the chemical nature of the antiscorbutic substance since that time.

My investigations were commenced in 1917, the purpose being to learn as much as possible concerning the chemical constitution of the antiscorbutic substance. It had already been shown by Holst and Froelich and by Hess (3) that this substance was soluble in 95 per cent alcohol, when the alcohol was acidulated.

Only young healthy guinea pigs were used. On a suitable diet, these animals develop scurvy with great regularity on about the fifteenth day, after which they lose weight rapidly and usually die before the thirtieth day with all the lesions of the disease.

The scurvy-producing diet used has consisted of whole clipped oats, wheat bran, hay, a mixed scratch feed prepared for chickens, bread, and sterilized milk. All of these foods were supplied in abundance and the guinea pig allowed to choose his ration. Water was supplied from the tap. It is a hard water containing a considerable amount of calcium salts. It will be seen that this varied diet is complete in all ordinary food principles, and yet at the same time every item is deficient in antiscorbutic properties. Milk probably contains all necessary food elements, but the accessory food substances were destroyed by sterilization at fifteen pounds pressure. However, either the scratch feed alone, or the oats alone, are sufficient to protect fowls against polyneuritis, and fowls are most susceptible to a deficiency of antineuritic vitamin. The grains in the scratch feed also contain fat soluble vitamin.

The guinea pigs were weighed daily. When fed this diet, guinea pigs gain weight regularly for about fifteen days, or until they develop symptoms of scurvy, after which they lose weight with great rapidity. Chart No. 1 shows the weight curve of a guinea pig on this scurvy-producing diet. This may be compared with chart No. 2 showing the normal weight curve of a guinea pig on this scurvy-producing diet together with the customary amounts of fresh carrots or cabbage used in feeding laboratory animals. It may be mentioned here that all animals dying in the experiments were subjected to a post mortem to determine the cause of death, and to study the pathology of scurvy.

There are numerous scurvy-preventing foods, but in these experiments the juices of citrus fruits, including orange juice, lemon juice and grapefruit juice, have been used. These juices were found to be efficient antiscorbutics and at the same time are otherwise suitable for the preparation of extracts and are readily obtainable in quantity.

Attempts were also made to work with grass. Fresh green grass is a most efficient antiscorbutic and a few grams (2-5) daily readily prevent scurvy in guinea pigs and larger amounts cure the disease (see Chart No. 3); but extracts of grass are more difficult to prepare and they are not as effective as the fresh grass and lose their efficacy in a few days. Similarly Holst and Froelich found that alcoholic extracts of cabbage were ineffective but that the active principle could be extracted by acid alcohol. The importance of an acid reaction and the greater availability of the acid fruits for experimental work is apparent.

Before proceeding to present the experimental work, it appears desirable to discuss briefly the signification and use of the word *vitaliment*. Although McCollum (1) opposed the conception, it has become increasingly evident that the diseases beriberi, scurvy, xerophthalmia, pellagra (4), and rickets (5) are due to the deficiency of specific substances in the diet. Several phrases have been used to describe these substances. Hopkins called them "accessory food substances." But in addition to being complicated, this name suggests that such substances are of minor importance to nutrition, whereas the fact is that definite, though small, quantities of these foods are absolutely essential for the maintenance of health and even of life.

The nomenclature used by McCollum, namely, "*fat soluble A*" and "*water soluble B*," has been accorded a popularity that is surprising in view of the fact that the use of the name "*water soluble B*" was based on the assumption that only one factor was water soluble and one fat soluble. It has been shown that at least two such substances are water soluble, namely, the antineuritic and the antiscorbutic substances; and there is, as yet, no evidence that there may not be more than one fat soluble substance. The substance that prevents rickets is found in cod-liver oil, and the substance that prevents xerophthalmia in rats is found in butter. It seems hardly probable that both of these diseases can be caused by the deficiency of the same substance. Moreover, all of these substances are soluble in other solvents in addition to water and fat.

The word *vitamine* has been generally used to describe these dietary constituents in spite of much criticism based on the fact that amine has a definite chemical signification not very applicable to any of these substances with the doubtful exception of the antineuritic *vitamine*.

which at least is a nitrogenous base. The writer has hitherto maintained that vitamine was the best word as yet employed, having at least the virtues of being a single word instead of a phrase, of signifying that these substances are essential to life, and of being very generally accepted and found in the dictionaries. However, it now seems that the word vitaliment is preferable inasmuch as it does not commit us to any chemical definition of these substances and means all that we know at present, namely, that these food principles are indispensable to life. It will be easy to designate the particular vitaliment under discussion, as for example the antineuritic or the antirachitic or the antiscorbutic vitaliment.

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II. PRELIMINARY EXPERIMENTS

IN accordance with the technique outlined in the previous paper, the first step was obviously to determine the minimum protecting dose of the fruit juices to be used. In all experiments the protective juice or extract was fed to the guinea pig daily by means of a capillary pipette. If the fluid is instilled slowly the guinea pig soon learns to drink it, and by this method there is no doubt as to the exact quantity of protective extract consumed by each guinea pig, a most important point in feeding experiments.

Experiment No. 1, to determine the minimum protecting dose of lemon juice. Eight guinea pigs were placed on the scurvy-producing diet.

Two received, in addition, one cubic centimeter of lemon juice daily.

Two received two cubic centimeters of lemon juice daily.

Two received three cubic centimeters of lemon juice daily.

Two received five cubic centimeters of lemon juice daily.

The results of the experiment indicated that even one cubic centimeter of lemon juice affords some protection from scurvy, for these guinea pigs did not develop scurvy for 31 days and they were still living after 51 days, when they were killed. One of the pigs receiving three

cubic centimeters appeared to be protected for 50 days, but the second developed scurvy in 32 days and died of scurvy in 43 days. The guinea pigs receiving five cubic centimeters of lemon juice remained well and gained in weight for 100 days, when the experiment was discontinued. (See Chart 4.)

It was similarly found that five cubic centimeters of filtered orange juice was about the minimum daily protective dose, and the grapefruit juice was of equal potency or slightly superior. It should, however, be noted that the potency of these fruit juices varies. I have had samples of both lemon juice and orange juice that had lost most of their antiscorbutic properties. This occurred toward the end of the season when the fruit has been on cold storage for some time. It is believed, therefore, that only fresh fruit should be used either for experimental purposes or for therapeutic use in scorbutic patients. Hess (1) similarly found that fresh young vegetables were more effective than older ones.

Experiment No. 2. To determine the alcohol solubility of the antiscorbutic vitaliment. A measured quantity of filtered lemon juice was evaporated to a gummy consistency by a current of air from an electric blower. The dried residue was extracted with a quantity of absolute alcohol equal to half the volume of the original juice and the alcoholic extract filtered off and tested. Before use an amount equal to five cubic centimeters of lemon juice was evaporated in a dish in front of an electric fan and the residue free from alcohol redissolved in water and fed to guinea pigs.

Two guinea pigs were placed upon the scurvy-producing diet and given, in addition, a daily dose of five cubic centimeters of the alcohol soluble portion of lemon juice. Both pigs remained healthy and gained in weight for 100 days, when the experiment was discontinued. (See Chart No. 5.)

This experiment was repeated, using orange juice instead of lemon juice, with similar results. (See Chart No. 6.)

From these experiments it may be concluded that the antiscorbutic vitaliment in these juices is soluble in absolute alcohol. Furthermore, it appeared that the entire amount of the antiscorbutic vitaliment present in these juices was extracted by alcohol, because five cubic centimeters of the alcoholic extract afforded protection and five cubic centimeters of the fresh juice had been found to be the minimum protective dose.

It was also found that while the alcoholic filtrate of lemon juice kept well for at least a month, the alcoholic filtrate of orange juice deteriorated much more rapidly, so that it was advisable to prepare fresh alcoholic solution once a week to prevent the guinea pigs from losing weight.

Experiment No. 3. To determine whether the antiscorbutic vitaliment is soluble in ether. A measured quantity of lemon juice was evaporated in an open dish by means of an electric fan until it was a gummy mass. This mass was then extracted by stirring in a bottle with successive portions of ether for several hours until the extraction was complete. The ether extract, of a lemon yellow color and containing lipoids, was stored in a flask. An amount equivalent to ten cubic centimeters of the original juice was evaporated daily and the oily residue taken up with a minimal amount of alcohol and water, and the resultant cloudy emulsion was fed to a guinea pig, in addition to the regular scurvy-producing diet. Guinea pigs receiving this extract developed scurvy after the usual depletion period; the residue insoluble in ether protected.

We may conclude that the antiscorbutic vitaliment cannot be extracted from evaporated fruit juice by ether.

Experiment No. 4. To determine whether the antiscorbutic vitaliment is soluble in chloroform. Experiment No. 3 was repeated, using chloroform as the solvent. Guinea pigs receiving the substance extracted by chloroform developed scurvy. The residue insoluble in chloroform protected. The antiscorbutic vitaliment is therefore insoluble in chloroform.

In a similar manner it was determined that the antiscorbutic vitaliment is insoluble in carbon tetrachloride.

Experiment No. 5. To determine whether the antiscorbutic vitaliment is soluble in acetone. A measured quantity of filtered orange juice was evaporated to dryness and extracted with absolute alcohol as described in Experiment No. 2. The alcoholic extract was then evaporated to dryness and extracted with successive portions of acetone. The acetone extract so obtained was stored. Each day an amount equivalent to twenty-five cubic centimeters of the original juice was evaporated to dryness by an electric fan and the residue dissolved in water and fed to a guinea pig in addition to the scurvy-producing diet. Guinea pigs receiving this extract were protected and gained moderately in weight for 100 days. (See Chart No. 7.)

This demonstrates that the antiscorbutic vitaliment is soluble in acetone.

Experiment No. 6. To determine whether the antiscorbutic vitaliment is soluble in ethyl acetate. A measured quantity of filtered orange juice was evaporated to dryness and extracted with absolute alcohol. The alcoholic extract was then evaporated to dryness and extracted with acetone. The acetone extract was evaporated to dryness and extracted with successive portions of commercial ethyl acetate. Complete extraction requires about half the volume of ethyl

acetate as that of the original juice. Each day an amount of this ethyl acetate extract equivalent to 25 c.c. of the original juice was evaporated to dryness and the residue dissolved in water and fed to guinea pigs in addition to the scurvy-producing diet. Guinea pigs receiving this extract were fully protected against scurvy and gained rapidly in weight as shown in Chart No. 8. It was later determined that 10 c.c. of this extract was sufficient to afford protection. Therefore the antiscorbutic vitaliment is soluble in ethyl acetate.

The possibility that the antiscorbutic vitaliment might be an organic base somewhat similar to the antineuritic vitamine obtained from rice polishings and yeast was early considered by an experiment to determine whether it could be precipitated by phosphotungstic acid.

Experiment No. 7. Lemon juice was evaporated nearly to dryness and extracted with 95 per cent alcohol, the alcoholic extract being preserved in a flask. Fresh extract was made up every two weeks. Each day an amount equivalent to 10 c.c. of lemon juice was evaporated before a fan, taken up with water, rendered five per cent acid with sulphuric acid and precipitated by a saturated solution of phosphotungstic acid. The phosphotungstates were separated by centrifugation and suspended in a solution of citric acid. This mixture was then shaken in a separating funnel with amyl alcohol and ether, to remove the phosphotungstic acid, which is poisonous for guinea pigs. When the phosphotungstic acid was so removed, the precipitate dissolved in the citric acid solution. This solution containing citrates of the substance precipitated by phosphotungstic acid was fed to guinea pigs.

The filtrate after removal of the precipitated phosphotungstates was treated with an excess of barium hydroxide to remove the phosphotungstic acid. The excess of barium was then removed by careful addition of dilute sulphuric acid, and the filtrate so obtained was fed to guinea pigs.

A. Two guinea pigs were placed on scurvy-producing diet and given in addition a daily dose of five cubic centimeters of the original alcoholic extract of lemon juice. The guinea pigs did not develop scurvy and gained in weight for 100 days, showing that the antiscorbutic substance was present in the original extract.

B. Two guinea pigs were placed on the scurvy-producing diet and given in addition a daily dose of the substance precipitated by phosphotungstic acid from ten c.c. of lemon juice. These guinea pigs developed scurvy in the usual time.

C. Two guinea pigs were placed on the scurvy-producing diet and given in addition a daily dose of those substances not precipitated by phosphotungstic acid from 10 c.c. of lemon juice. These guinea pigs also developed scurvy after a slightly prolonged depletion period.

This experiment was repeated several times, using orange juice instead of lemon juice and with other modifications, but with similar results each time.

From this experiment it may be concluded that the antiscorbutic substance *is not precipitated by phosphotungstic acid*. The fact that the control experiment in which the filtrate was used also failed, does not vitiate this conclusion. It has been found repeatedly that an alkaline solution in some way impairs its activity rapidly; and in other attempts the filtrate was shaken with amyl alcohol and ether, to remove the phosphotungstic acid, but it remained inactive. On the other hand, had the vitaliment been precipitated by phosphotungstic acid it should have been recovered by the method used, which is a common method of treating organic bases and other substances precipitated by phosphotungstic acid. It is probable that the antiscorbutic vitaliment is decomposed by the action of phosphotungstic acid.

Experiment No. 8. Lemon juice was evaporated to dryness, extracted with ether and the ether extract discarded. The residue was dissolved in absolute alcohol, filtered and the alcoholic soluble portion purified by the addition of an excess of neutral lead acetate. The filtrate from this was nearly colorless and was fed in doses corresponding to 10 c.c. of the original lemon juice. Guinea pigs receiving the scurvy-producing diet were protected by this extract for a period of fifty days when the experiment was discontinued. Therefore the antiscorbutic vitaliment is not removed from solution by neutral lead acetate.

It was now desirable to produce an extract containing the antiscorbutic vitaliment in as pure a state as possible by means of the various solvents whose action had been determined in the previous experiments.

Experiment No. 9. One liter of filtered orange juice was evaporated to dryness by the electric blower. The apparatus used by barbers to dry the hair has been found very useful in this work as it furnishes a blast of hot air. The dried juice was extracted with five-hundred c.c. of absolute alcohol and the alcoholic extract evaporated to dryness. This residue was extracted with five-hundred c.c. of acetone and the acetone extract evaporated to dryness. This dried residue was then thoroughly worked up with ether until completely extracted. The ethereal extract was discarded and the residue was freed from ether by the fan and dissolved in one-hundred c.c. distilled water. After standing a few hours, a heavy white precipitate forms which has been found to consist of beautiful microscopic needles in rosettes. This crystalline precipitate may be readily separated by filtration or centrifugation, and is almost insoluble in water, alcohol or weak acids. It was determined by numerous experiments that these crystals were of no importance in

curing or preventing scurvy and that the filtrate contained the active substance. The filtrate was therefore evaporated to dryness by the blower and the dried residue extracted with five-hundred c.c. of ethyl acetate. Experience had shown that the antiscorbutic substance is more soluble in water than in ethyl acetate. Accordingly it was removed from the ethyl acetate by shaking equal parts of the ethyl acetate solution and distilled water in a separatory funnel and drawing off the water extract so obtained. This constituted the final extract and cured and protected guinea pigs from scurvy in doses equivalent to twenty c.c. of the original juice daily. (See Chart No. 9.)

4 The extract so obtained is quite strongly acid and slightly bitter, reduces Benedict's solution strongly, contains much carbon but practically no nitrogen by the Kjeldahl method, practically no mineral matter, no lipoids, no proteins or amino acids even by the ninhydrin test. Yeast causes fermentation with the production of much gas. This extract will be discussed further in a later paper.

CONCLUSIONS

1. Scurvy can be produced in guinea pigs with regularity by feeding a liberal and varied diet consisting of oats, mixed scratch feed, bread, sterilized milk, and hay.

2. Scurvy may be prevented by the daily addition of five grams of green grass or five c.c. of filtered orange, lemon, or grapefruit juice, and cured by larger amounts.

3. The antiscorbutic vitaliment is soluble in water, absolute alcohol, acetone, and commercial ethyl acetate.

4. The antiscorbutic vitaliment cannot be extracted from the partially dried juice by ether, chloroform, or carbon tetrachloride.

5. The antiscorbutic vitaliment differs from the beriberi preventing vitaliment in the following particulars:

A. The antineuritic vitaliment is adsorbed by finely powdered animal charcoal. The antiscorbutic vitaliment is not so adsorbed. (Harden and Zilva—confirmed by the writer.)

B. The antineuritic vitaliment is precipitated by phosphotungstic acid. The antiscorbutic vitaliment is not so precipitated, but is probably destroyed.

C. The antineuritic vitaliment is a nitrogenous base. The antiscorbutic vitaliment is apparently non-nitrogenous.

6. By means of the solvents mentioned above a purified extract has been prepared which is suitable for further chemical study.

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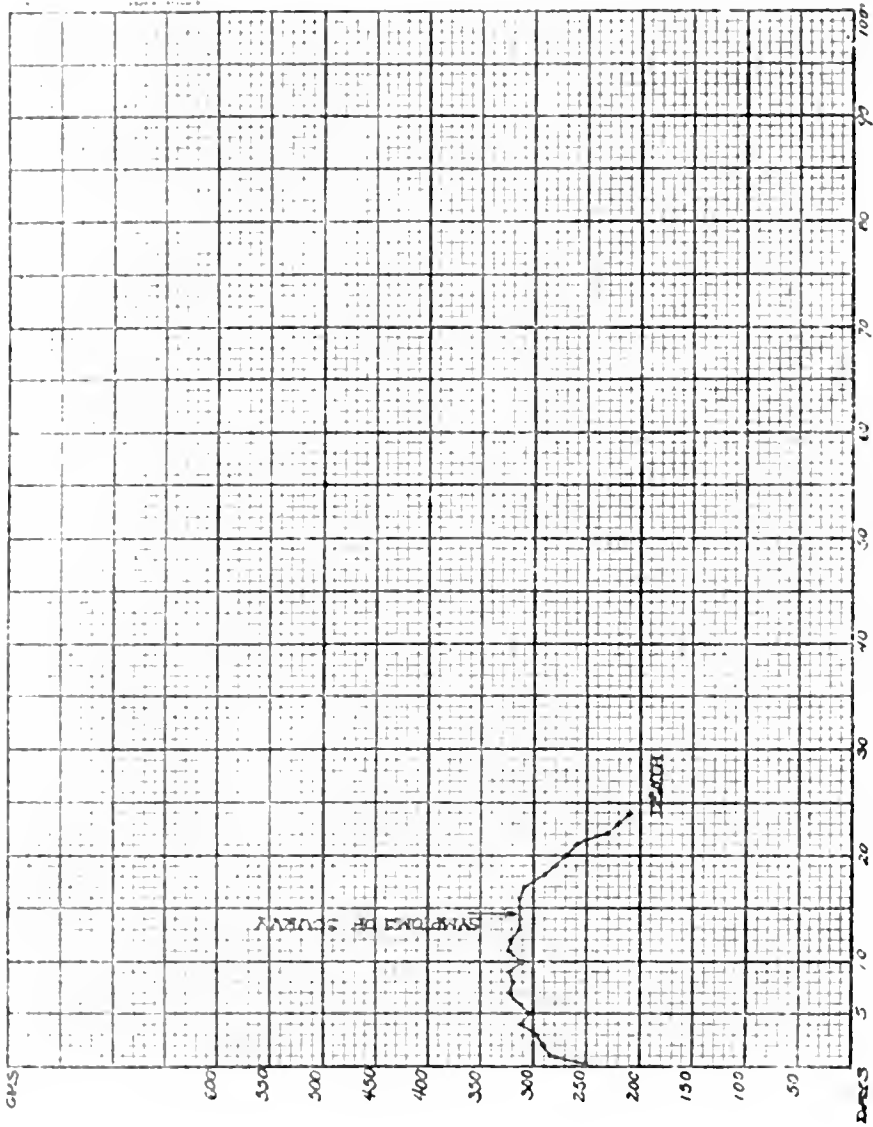


Chart No. 1. Typical Curve of Guinea Pig on Soury-Producing Diet

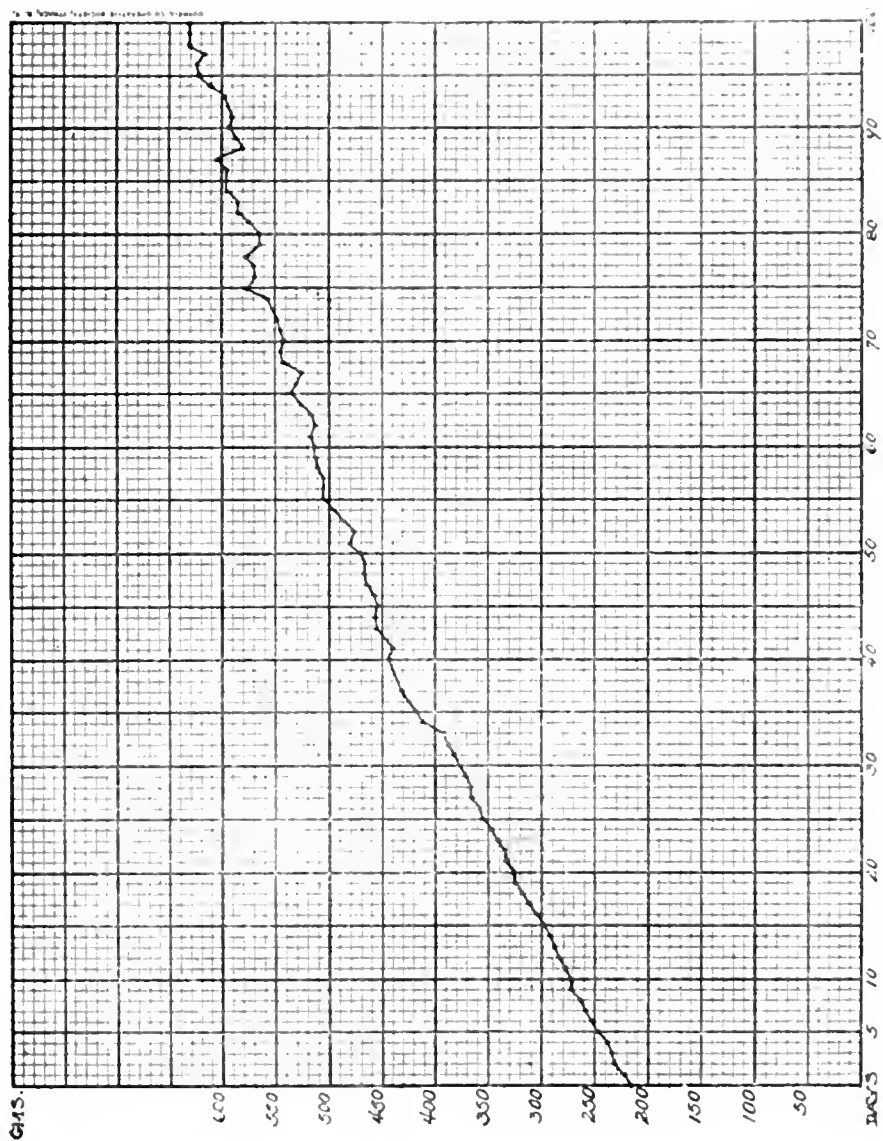


Chart No. 2. Normal Growth on Scurvy-Producing Diet Plus Fresh Vegetables.

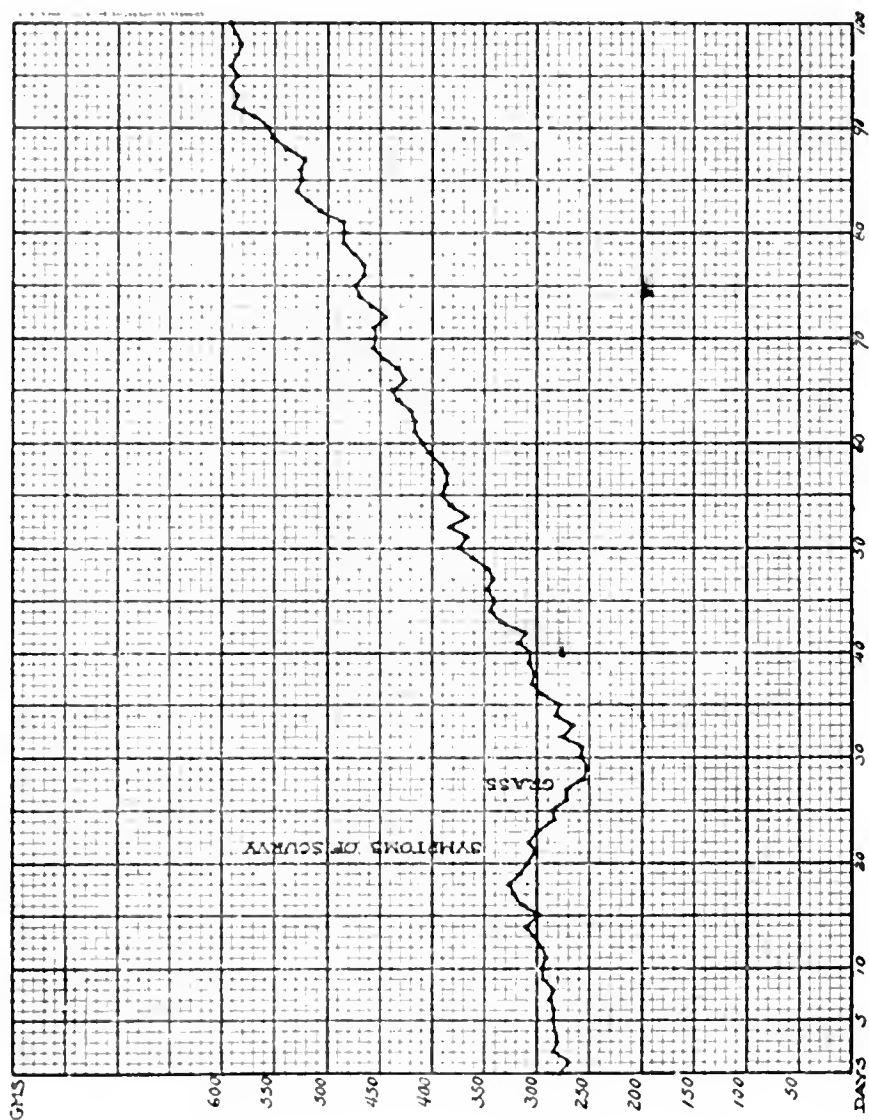
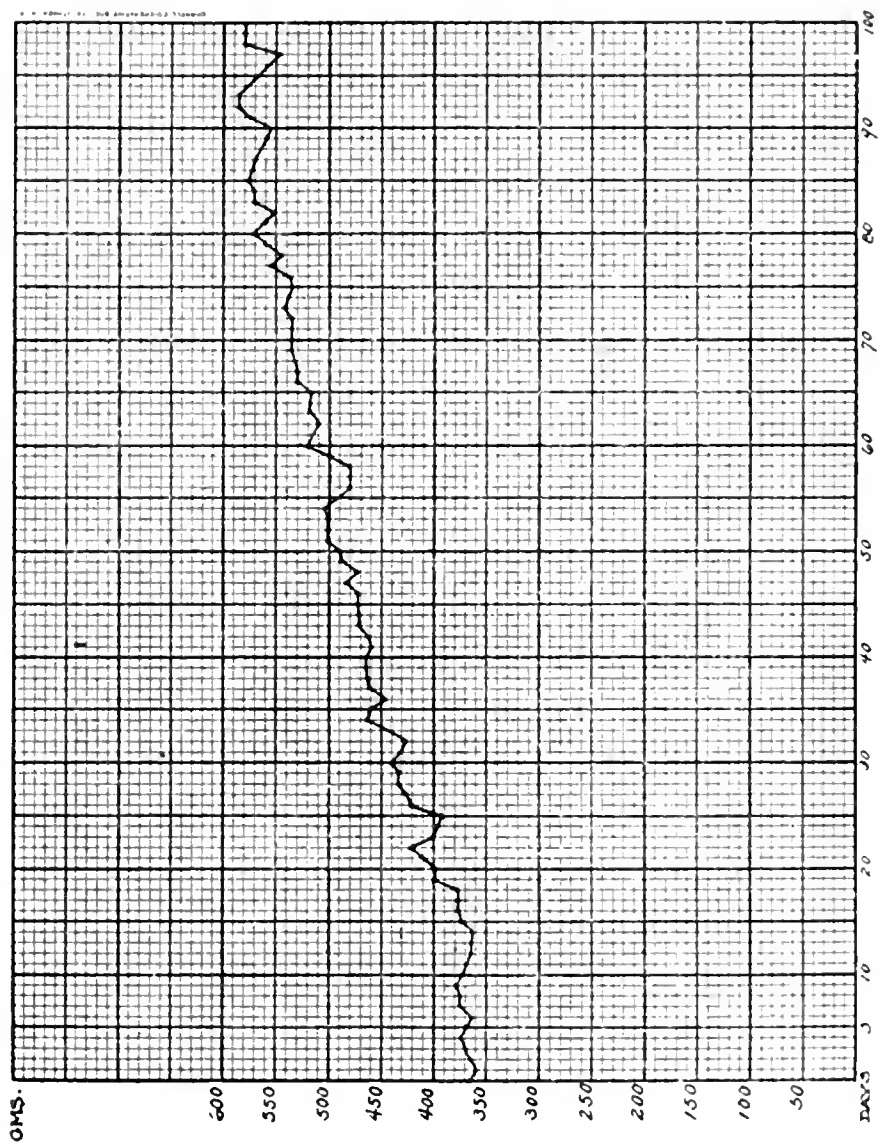
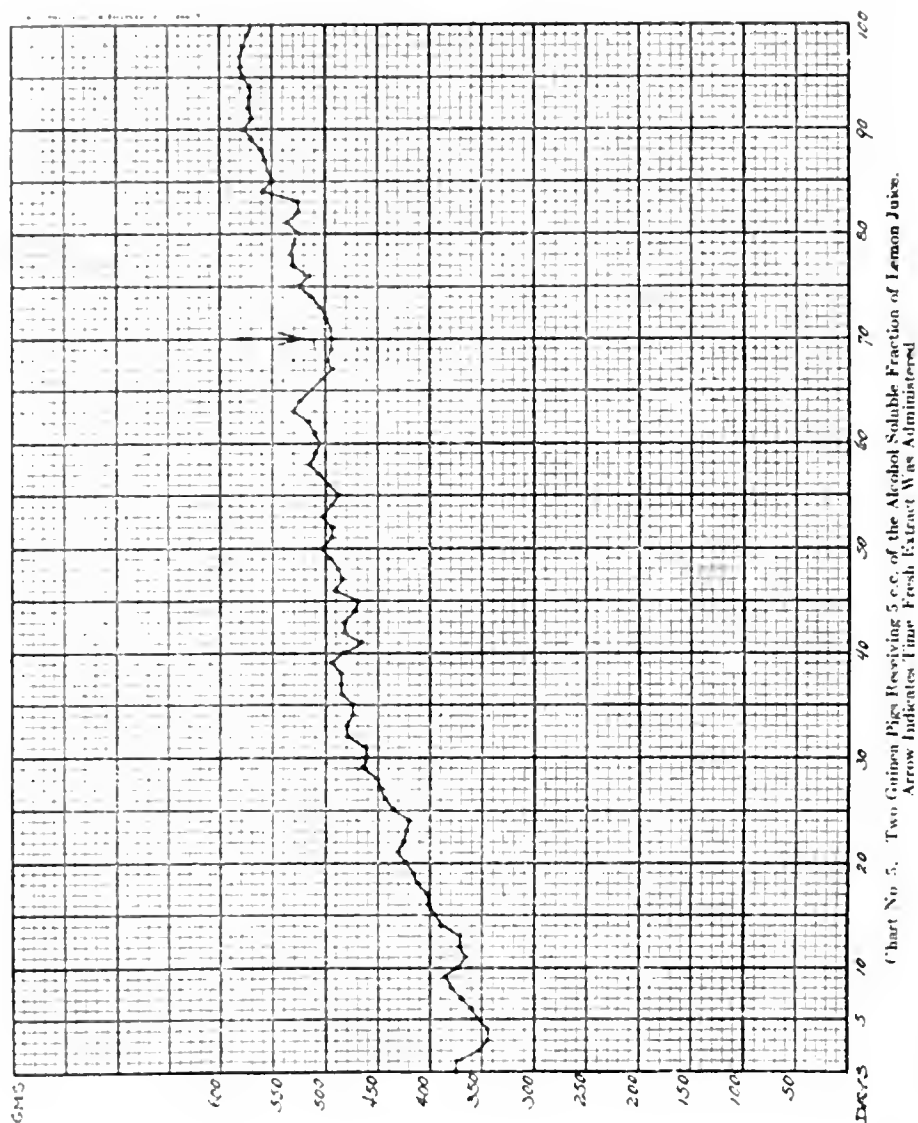
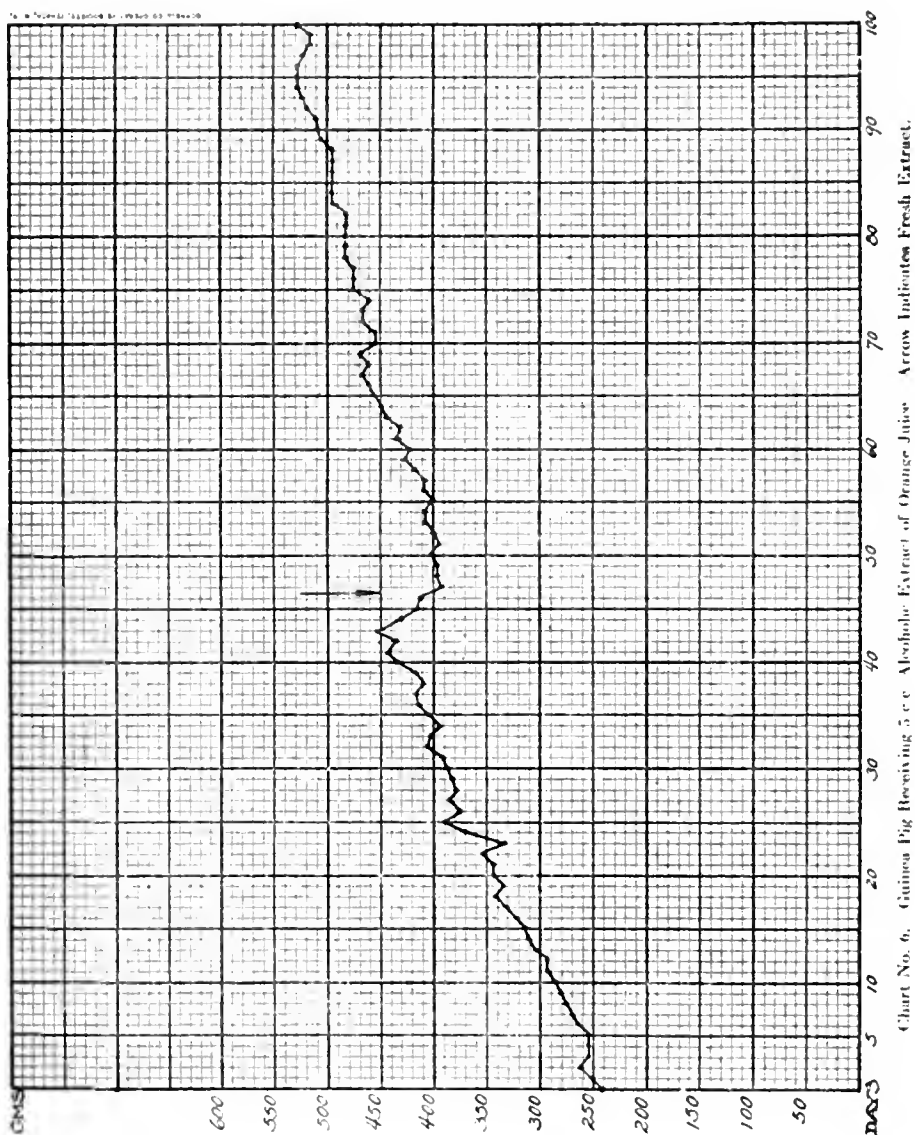


Chart No. 3. Effect of Fresh Grass on Guinea Pig That Has Already Developed Scurvy







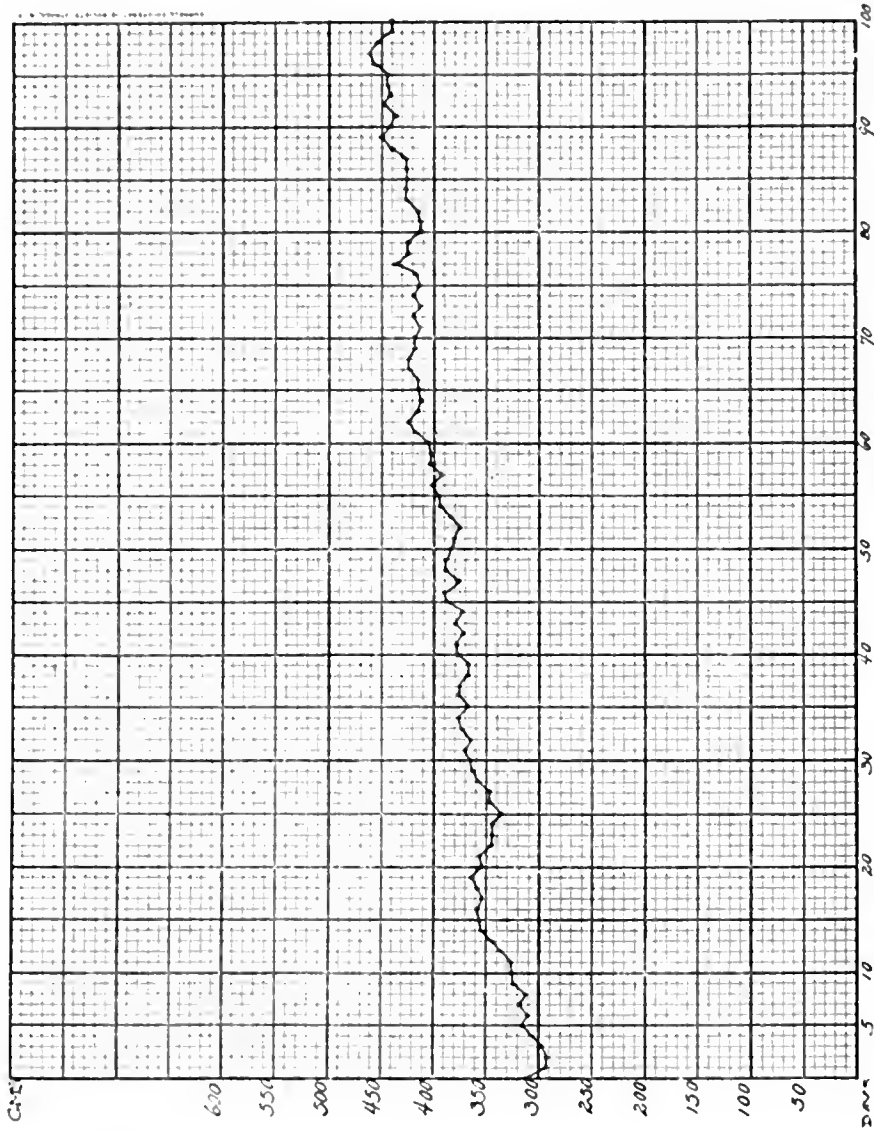


Chart No. 12. Guinea Pig Receiving 10 c.c. Daily Acetone Extract. On 70th Day Dose Increased to 25 c.c. to Increase Rate of Growth Without Result.

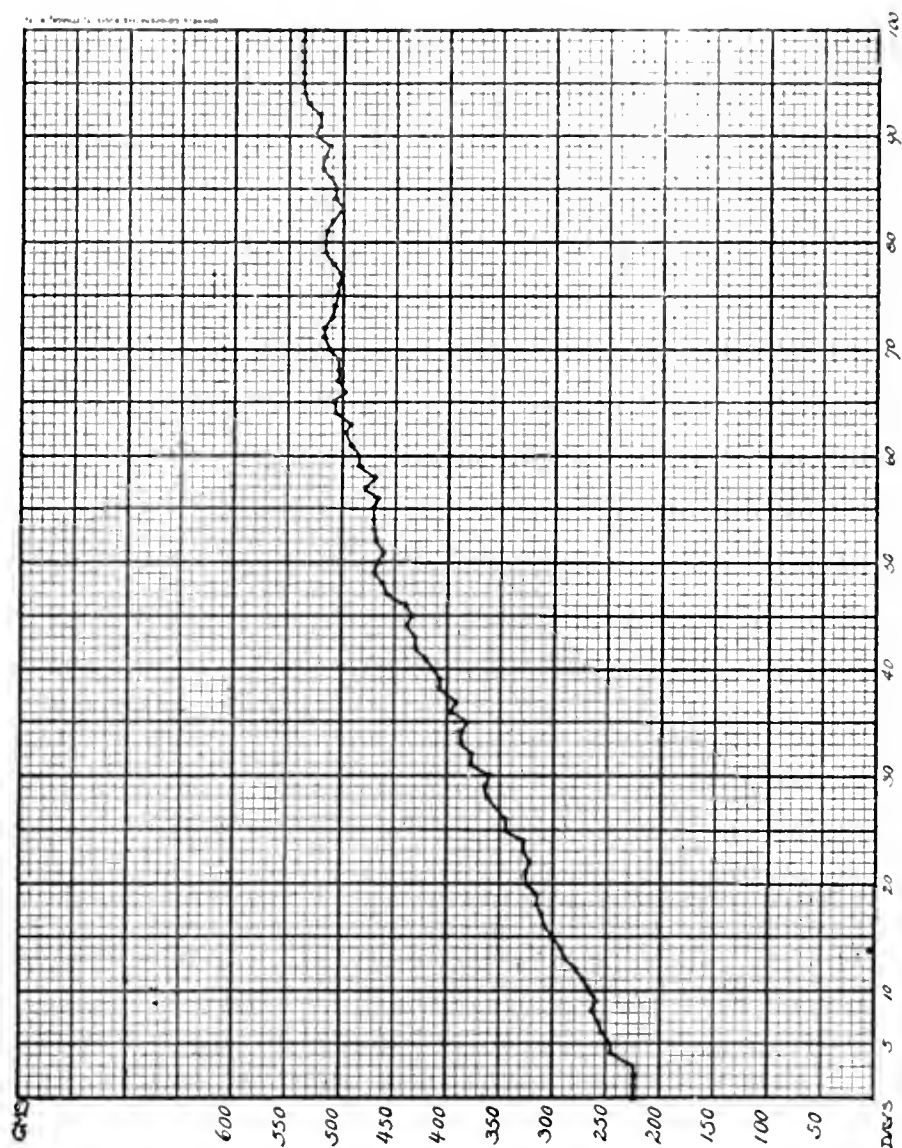


Chart No. 8. Guinea Pig Receiving 25 c.c. Ethyl Acetate Extract Orange Juice Daily

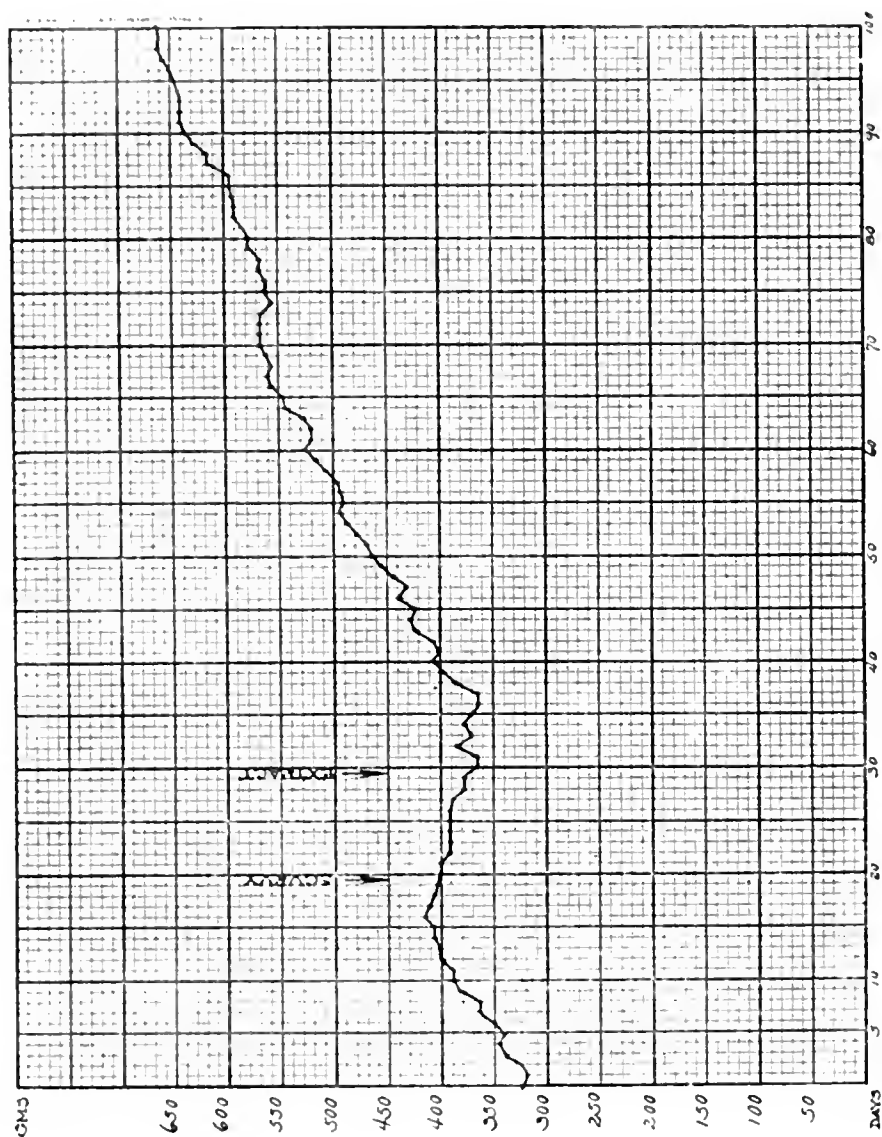


Chart No. 9. Guinea Pig Having Scurvy. Cured by Addition of 25 c.c. Daily of Extract Described in Experiment 10, Which Was Extracted With Alcohol, Acetone, Ethyl Acetate, and Water.

THE RESPONSIBILITY OF THE MEDICAL CORPS IN THE PROPER PHYSICAL DEVELOPMENT OF THE PERSONNEL OF THE ARMY

BY COLONEL JOEL E. GOLDTHWAIT

Medical Reserve Corps, United States Army

IN replying to the request of your Committee that I present a paper to this meeting, there was no question as to my willingness to accept the honor conferred, but the choosing of a subject that would be worthy has not been easy. The final selection was reached as seeming to me to best represent the broadest need of the Army that would be covered by my line of work, either for a peace-time or a combat basis, being especially applicable to the Training Camp periods which are before us.

It is, of course, improbable that we shall be obliged to go to war in the very near future, but even if such expectation existed, our work in the World War showed that it required a very short time to teach men enough of the school of the soldier to make them of combat usefulness, while to make men physically fit so that they could withstand the stress of active service required many times longer.

In peace time the Army has to do chiefly with the training of men so that they will possess the carriage of the body that is expected of the soldier as the basis of their best efficiency. To make men physically fit and strong is a worthy object, whether it has to do with making fighting men or plain citizens, and since the Army will probably have much to do in directing the training camps, both for the regular army as well as for the reserve army, it seemed well to take for my subject the importance of an exact knowledge of the mechanics of the body as the basis of such training.

That such knowledge is not commonly held, or at least practiced, by most of our citizens, is shown by the draft statistics, with one-third of the men of this age unfit for service because of physical defects, most of them correctable. In Massachusetts it was 46 per cent. Of the first four Divisions that went overseas, the care in the selection of the men that was observed later was not taken, and men who volunteered were accepted and sent over. This led to great numbers of men reaching France not fit to do combat duty, and to show how many of this type there were, in November, 1917, part of a battalion of one of the regiments of the First Division was sent out on practice maneuvers and were out twenty-eight hours, five of which were spent lying down. The maneuvers were said not to be hard, being maneuvers of retreat.

but the day following the return of the men to their billets, I myself saw 138 of these men in the Camp Hospital, with acutely strained feet, backs, knees, etc., sick enough to be in hospital. Naturally, unless our men were able to stand more than this they could not do that which was expected of them.

Cases of this kind were sent to the Base Hospital, but they were not sick, they were weak, and the stay in hospital not only used beds needed for the really sick, but the inactivity of the hospital increased the weakness.

This led to the establishment of the so-called Special Training Battalion, which was afterward copied in the United States as the Development Battalion, to which many of the unfit men of the second draft were sent to be made into strong men. Few of the men so assigned had organic disease, but most of them had extremely poor bodily mechanics, which could be corrected with training. The special organization need not concern us here, as that will be worked out as the need appears, but the principles underlying the work are, it seems to me, worthy of discussion.

In the first place, a strong body means one so trained that the natural standing position is with the head erect, chin drawn in, the chest held high, the abdomen drawn in or held flat, and the weight borne largely upon the anterior part of the feet. In this position all of the muscles are in balance, and no strain will come upon the ligaments, nor can the viscera sag so that their function can be interfered with. This is the ideal to be developed, and no elaborate examination is necessary to determine the fact, nor is a medical officer needed to tell that a man so using the body can be depended upon to put through the march or other duty that may be demanded.

In the early units as they were handled overseas, flat feet and lame backs were the two most common causes of complaint or assignment to hospital. Both of these conditions in the large majority of the instances are mere weaknesses, and are due to the faulty use of the body as a whole, so that the local strain can occur. The flat-footed men in the Army, as well as in civil life, stood with the body relaxed so that the muscles of the feet and trunk were used out of balance. Treatment without the correction of the primary cause is obviously purposeless, but if the body as a whole is properly trained, the height of the arch, whether very high or low, is of little importance, and can be depended upon to carry the body through its special task. Once such principles were recognized, not a man was discharged from the A. E. F. because of flat foot, and over 80 per cent were made equal for combat fitness, the other 20 per cent being trained for less strenuous duty.

Exactly the same thing is true of the common lame backs, with their "lumbago," "sciatica," etc. Once the normal spinal curves are established, not only do the symptoms disappear, but the general vigor is greater.

In the ideal position, with chin drawn in, chest up, abdomen drawn in, and weight forward on feet, the muscles are all in balance, and once this becomes the habit with the individual, it will be the position in which there will be the least possible fatigue. Not only will the spinal curves be normal and the tarsal arches supported, but the diaphragm is necessarily so held that it is able to perform its part in the respiration and circulation normally. The ribs are spread so that the diaphragm has the full width for action, and since the suspensory ligament is attached to the sides of the low cervical spine, in this erect position with the chin drawn in, this ligament is tightened and the diaphragm raised to its ideal position. When so used the neutral position of the diaphragm is midway between full inspiration and full expiration.

With the body drooped, the diaphragm drops to the low point, with almost no movement in the respiration. The position and limited movement is easily demonstrable with a fluoroscope, and this imperfect action must not only interfere with the respiratory function, but the effect upon the circulation is probably greater. Since the diaphragm is largely responsible for the flow of the blood to the heart from the abdomen and legs, anything which interferes with its action must show itself by stasis or congestion in these regions. The congested feet of the drooped individual finds easy understanding, as well as the rapid change in the appearance of the feet as the body is held erect.

In the many cases of D. A. H. (deranged action of the heart) which were seen in the A. E. F., while there seem to have been many theories as to the cause, there seems to be no question as to treatment. In our Army they were sent to the Training Battalion or to the Convalescent Camps to be trained to stand up straight. In the British Army the same type of case was sent to the Command Depots. The erect position in which the diaphragm could work normally was not associated with disturbed heart action.

Not only this, but the function of the abdominal viscera must depend upon the way the body is used. In the erect position not only is the diaphragm raised and the ribs spread, but the abdominal wall is in contraction, so that the viscera are held in place. The effect of this upon the function of stomach, liver, intestine, kidney, pancreas, etc., there is not time to go into detail about here, but as one does not see the D. A. H. in the erect individual, so also one does not see the common digestive disturbances nor the orthostatic albuminuria or the evanescent

glycosuria, when the body is held erect. The mere change in the name of orthostatic albuminuria to lordotic albuminuria is suggestive.

With the body erect not only should the best visceral function be expected, but since the circulation in the spinal cord and head is the most free, it is also to be expected that there will be the greatest mental and nervous vigor or endurance. The athletic trainer never found the element which he described as "guts" in the drooped type of body so commonly seen about us.

The standard set in the Army in the Special Training Battalion was the same as had been set in civil life before: the erect body, with head held erect, chest drawn up, abdomen flat, and weight forward on the feet. Any method of training which leads to this should be approved. That which fails in this should be disapproved, and among other systems that which leads to the extreme hyperextension of the lumbar spine, with the shoulders thrown back, the so-called military position, should not be approved, since this cannot be maintained for long without strain.



OBSERVATIONS IN ITALY¹

BY CAPTAIN FRANK L. PLEADWELL

Medical Corps, United States Navy

LATE in the year 1916, The American Medical Mission to Great Britain, of which I was the naval member,² had completed the liberal program of inspections arranged for it by the British authorities, and its members had begun to look about for additional fields of investigation.

An officer of the naval medical corps had been in Germany since the visit of the U. S. S. *Tennessee* to Europe early in the war. Another officer had already reported upon conditions in France.

The only country remaining to which no observer had been assigned, and which promised a remunerative field for medical investigation, was Italy. This country, moreover, had something of a personal appeal, as it was the one to which, earlier in the war, I had been nominated for duty as an observer, but through a shift of fortune orders were never issued. Now, a request to go to Italy on temporary duty received favorable consideration, and it only remained to outline a plan of action, gather the necessary letters of introduction, perfect one's papers and passports, and proceed. But these preliminaries were time-consuming processes in those days and it was the end of January, 1917, before I could complete them and begin the first stage of the journey to Rome.

In Rome there was further delay. No one seemed to want a neutral observer about at that stage of the war, and it was March before the efforts of the American Ambassador,³ together with the aid that may have been derived from my letters of introduction,⁴ achieved results.

In the interval following my arrival in Rome and before proceeding to Udine, I employed my time in calls upon the officials with whom my mission might properly bring me in contact, in attending clinics at the Policlinico, where I had an opportunity of seeing Professor Bastianelli operate, and in a visit to Naples to inspect the Naval Medical School. (*R. Scuola di Sanità Militare Marittima*.)

The Vice-Director of this latter institution was Dr. Carlo M. Belli,

¹ Read at the annual meeting held at Boston, Mass., June 2-4, 1921.

² The Army members of the mission were: Lieutenant-Colonel (now Colonel) A. E. Bradley, M. C., U. S. A.; Major (now Lieutenant-Colonel) Clyde S. Ford, M. C., U. S. A.; and Major (now Lieutenant-Colonel) Wm. J. L. Lyster, M. C., U. S. A.

³ The Hon. Thomas Nelson Page, to whom I carried a note of introduction from the late Hon. Walter Hines Page, American Ambassador to Great Britain.

⁴ I was fortunate in having letters of introduction from Lord Northcliffe to Baron Sonnino, Minister of Foreign Affairs, and to Captain Pirelli at the Comando Supremo; and from Sir William Osler to Professor Raffaele Bastianelli. Needless to say these letters were of great assistance.

author of the well-known work on naval hygiene, whom I had met in September, 1912, at the Fifteenth International Congress on Hygiene and Demography. Unfortunately, at the date of my visit to Naples he was away in Paris in attendance upon the Allied Sanitary Conference, but Dr. Saccone, the Director of the School, very kindly showed me the buildings and equipment and explained the details of the curriculum.

The school was closed on account of the war, all students having been called to active service, and of the usual administrative and teaching staff only Drs. Saccone and Belli remained.

The fifty students ordinarily accommodated here lived within the grounds, in dormitories. The buildings were not constructed originally for school purposes, but for a monastery. They had been adapted to present uses most successfully.

The course extended over a period of a year and comprised the subjects of tropical pathology, naval hygiene, war and emergency surgery, medico-legal and military medicine, practical laboratory exercises in microbiology and clinical microscopy, and sanitary regulations. Besides the usual chemical, bacteriological, and hygienic laboratories, the School possessed an extensive museum containing models of the sanitary appliances used in ships, medical and surgical accessories for ships' use, samples of stretchers, ships' models, and full-size reproductions of sick-bays, operating rooms, etc., as constructed in Italian men of war. These facilities were utilized in teaching medical duties and routine aboard ship.

After this inspection and following a visit to the University of Naples and the Charity Hospital, I returned to Rome to await the long-expected permission to inspect the medical establishments at the Front. Authority to do this finally arrived on the evening of March 1, and by the evening of the next day I was on my way to Udine, where General Headquarters (Comando Supremo) was located at that time.

Before taking up the details of observations on the Front, it will be useful to make a brief survey of the strategic area, and present a short summary of the operations which had taken place up to the time of my visit.

Looking at a map of northern Italy, it is apparent that the strategical position of Italy with respect to Austria was one of great danger. The Lombardo-Venetian plain is fringed with mountainous country along the whole frontier, and the passes were in the hands of the Austrians at the opening of hostilities. The Trentino projected like a wedge into Italian territory, and, except for a portion of the border near the Adriatic, Italy had literally to make all advances up the sides of steep

mountains the heights of which were strongly held by the Austrians. The mountain valleys converging from the Carnic Alps in the direction of the Tagliamento valley also gave the Austrians opportunity for flank attack upon any Italian force operating in the plain.

It was evident that before Italy could project any major offensive against Austria, the left of the Italian Army must be secured, as well as its base of operations in the plains, by taking and containing the mountain passes and all threatening positions to the north. The only sector where a major offensive was at all feasible was on the eastern border of northern Italy at a point south of Pontebba to the sea. Even here, particularly along the middle and upper sections of the Isonzo, the ground was most difficult for operations. North of Tolmino there were but few openings in the mountains, and to the south of this town the plateau of the Carso presented unfavorable ground for an offensive. Nevertheless, it was in this latter region that the main Italian attack of June, 1915, was launched.

From the Trentino eastward to Pontebba the Dolomites formed an almost insuperable barrier to advances by both forces, and neither side expected to gain any considerable advantage here, except to capture and hold the principal passes over the mountains.

Reduced to its simplest terms, Italy's strategical plan, by reason of topographical conditions, was to secure and hold the passes to the north, and advance to the east.

After May 22, 1915, when the order for general mobilization was issued, four armies took the field, two being assigned to the northern and two to the eastern frontier. An independent force was detailed to operate in the Carnic Alps. The Second and Third Armies were used in the eastern offensive, the First and Fourth in the northern. An additional army, the Fifth, came into being on the occasion of the Italian reverses following the Austrian offensive of May, 1916.

The first offensive movements cleared the Friulian plain, the Austrians retiring upon the Isonzo, and on the same day troops on the Trentino frontier advanced into Austrian territory and attempted to secure positions more easily defended. In spite of tremendous natural difficulties, the Italians in this area reached a number of dominating points, and attained their main objectives.

The hardest fighting took place on the Carnic frontier. Both sides engaged in a struggle for the mountain passes, but before the middle of June a line of commanding posts was solidly established by the Italians, and any immediate danger of a flank attack upon the armies engaged in the main operations on the eastern frontier, ceased to exist.

On the Isonzo, affairs had not gone according to the preconceived plan. The Italians had entertained the hope that a sudden advance across the plain below Goritzia would enable them to gain a footing on the Carso. This was the area which promised the least difficulties to a main assault.

From the Plezzo valley to just above Goritzia the river Isonzo is a rapid current running in a narrow gorge, but below this point to the sea the fall is relatively slight, and, except when in flood, the river runs into a broad shallow stream, which ordinarily would present few difficulties to the passage of an attacking army.

But the snows melted later than usual in the spring of 1915, and when the Italians reached the river they found it in heavy flood. In addition, a delay in the main advance had occurred through the failure of a cavalry force to carry out orders and cross the river at Pieris, in order to secure a footing on the Carso before the Austrians had time to destroy the bridges and the roads at that point. These circumstances combined to give the Austrians additional time to perfect their plans for what proved to be a stubborn resistance.

At Sagrado there was a dam across the Isonzo, regulating the amount of water entering the Sagrado-Monfalcone canal. As soon as the Italians attempted to cross the river at Pieris, the Austrians closed and secured all openings in the dam, and blew out one bank of the canal. The effect of this operation was to inundate all the low-lying country at the foot of the Carso from Sagrado to Monfalcone. Thus an additional barrier confronted the Italians when they crossed the river after the initial setback.

For weeks hard fighting kept up along the line of the lower Isonzo to the sea, as well as along the upper valley below Plezzo, but by late June the Italians had established the bridgehead beyond Sagrado. The possession of this bridgehead was important to the general attack upon the Carso plateau to be projected later.

When the Italians found it impossible to break through the Austrian lines they dug themselves in and methodically prepared for the new offensive, which took place in July.

The battle of the Carso continued throughout the last days of July and the first week in August, and ended by the Italians being firmly established on the edge of the plateau. Elsewhere, as at Tolmino, at Caporetto in the Carnic Alps, and in the Trentino, a ceaseless warfare persisted, the details of which it is impossible to discuss here.

The operations as a whole in Italy, as elsewhere, had finally settled down to a system of trench warfare, except that the main lines were well separated in many sectors, and the character of the trenches, due to the rocky nature of the ground, was different from that seen on other fronts.

On October 18 a general bombardment by the Italians began along the whole of the lower Isonzo line from Plava to the Adriatic, and on the 21st another great offensive was launched. The main objectives in this attack were to gain a better foothold on the Carso plateau, to occupy the Austrian lines on the right bank of the Isonzo from Monte Sabotino to below Podgora, and to widen the Plava bridgehead so that Monte Santo could be attacked from the north. The offensive was maintained throughout October and November, slackening early in December, but more or less fighting continued to the end of the year. The line wavered back and forth, but finally the advantage was seen to be distinctly with the Italians. At the Goritzia level that city was at the mercy of the heavy guns of the Italians. On the Carso, progress was made on the southern rim of the plateau toward the lake of Doberdo, and the San Michele summit was occupied.

The Italian lines had likewise been advanced at several other places, but as yet no actual break in the Austrian system of defense had been made.

During the first months of 1916 the mountains were under deep snow, and the winter conditions inevitably brought about a lull in operations. Except for occasional local actions, quiet prevailed on all the frontiers.

The major events in 1916 were the Austrian offensive in the Trentino, beginning May 14, and the Italian offensive on the lower Isonzo, which started in early August.

The Austrian offensive in the Trentino began with a bombardment along the whole front and eventually forced a retirement of the Italian center, and finally a withdrawal of the whole Italian line in the area to the southward of Val Sugana. The resulting position of the Italians was most critical, and General Cadorna had to consider measures to prevent an advance of the Austrians into the Venetian plain.

On the morning of May 21, General Cadorna gave the order to draw up plans for the formation of a new army, to be assembled in the Vicenza district. This army, which was to become the fifth, was in readiness by June 2, exactly ten days after the order for its formation was issued. All available reserves were thus concentrated between the Tagliamento and the Isonzo, where they could be moved to any point in the line needing reinforcement, or used in the offensive being prepared against Goritzia and the Carso.

The organization of a force of more than half a million men, with complete equipment, ammunition, and supplies, in a period of ten days, stands out as one of the notable achievements of the war.

But by June 2, it was apparent that the Austrians would not reach the plain. The reinforcements already sent to the Pasubio district

sufficed to hold them, and in consequence the Fifth Army became available for offensive purposes, but remained in position until the heavy fighting in the Pasubio and Asiago areas had subsided. This fighting continued without cessation for fifteen days.

Before the heavy guns had died down in the Trentino, General Cadorna had forced the defences of Sabotino, Podgora, and San Michele, on the Isonzo front, occupied the whole western segment of the Carso, and driven the Austrians from Goritzia.

This offensive had been launched on August 6, and hard fighting continued for several days. The Austrian line broke on the 10th, and ground was gained by the Italians on each succeeding day until the 15th, when the Austrian resistance stiffened, and the Italian advance was checked. In September, October, and November other offensive movements gained important points for the Italians. In December, persistently unfavorable weather prevented further major operations here and relative quiet prevailed.

In the Setti Comuni (Trentino) also, the weather prevented active operations, for the snow had come early, falling deeply on the Austrian trenches and entanglements, concealing them fully, and even preventing the detonation of shell.

The positions of the contending forces changed but little during the winter of 1916-17, and a state of comparative inactivity prevailed on the various fronts until well into the Spring of 1917.

Such was the situation when I arrived at Udine on March 3, 1917, and reported at the Comando Supremo.

The military train to the north left Rome at eight o'clock in the evening of March 2, and arrived at Udine at noon the next day. The passengers were chiefly officers and men returning to their posts, from leave, but there was one lady passenger, who had obtained the unusual privilege of visiting her husband at the front.

At the station at Udine I was met by an officer from the Comando Supremo, Captain Count Ceriano, who conveyed the sad news of the death, by accident near Udine the previous day, of Major Heiberg, the American Military Attaché. He had preceded me to the front by only a few days. My help was requested in connection with this distressing occurrence, and was willingly extended. At the time I was the only American officer on the Italian front, and acted as an intermediary between the American Embassy and Italian Headquarters, until the Embassy representatives could arrive from Rome.

Having called with Captain Pirelli on the Chief of the Ufficio Stampa (Press Bureau)⁵ at the Comando Supremo, Colonel Count Eugenio

⁵ Only, if the functions of the Press Bureau was the charge of visitors to the front.

Barbarich, the latter courteously asked me to dinner that evening at the Officers Club. The Club building is historic. It was occupied by Napoleon in 1797 at the time of the signing of the Treaty of Campo Formio, and it was here that Josephine is said to have come from Paris and to have had that tearful meeting with her lord and master.

Udine is a town of about 25,000 inhabitants, the capital of the Province, and also the seat of the archiepiscopal see of Venetia. The archiepiscopal palace is one of the few pretentious buildings of the town.

In the center of the town rises a hill crowned by an old castle, at one time the residence of the patriarchs of Aquileia, but now used for a prison. The legend about this hill is of interest. It rises in the middle of the plain and is said to have been thrown up in the fifth century by Attila during a raid into northern Italy, in order that from this artificial hill he might witness with greater ease the burning villages in the plain.

Udine was originally a walled town, but very few traces of the old walls now remain. The older sections still retain some of the characteristics of a community developing within walls, namely, a crowding together of houses, with few open spaces, and streets both narrow and crooked.

In March, during my visit, the sun seldom appeared, there was much rain, and once even snow, and the general impression, after the sun of the south, was one of gloom. It was particularly dreary in the evenings, when, for military and economic reasons, the lights were few and dim, and reading, in consequence, very difficult. The only recourse then was to seek oblivion in slumber in the cell-like room at the Hotel Croce di Malta, where visitors to the front were lodged.

Although anxious to begin inspections at once, I was to encounter further delay. Upon arrival at Udine, and after completing the duties which fell to me in connection with the obsequies of our military attaché, I reported to the Comando Supremo, and found that the authorities there had received no advices regarding my visit to the War Zone, although negotiations concerning this matter had been carried on between our Embassy, the Ministry of War, and the Ministry of Foreign Affairs, since February 8. I had been assured in Rome on the evening of March 1, by an official connected with the American Embassy, that a letter authorizing my departure had arrived from the Ministry of Foreign Affairs, and that I was quite free to proceed. As this letter seemed to be ample authority, and no other instructions were received, I left for Udine and General Headquarters the following evening.

This experience connected with my visit to the War Zone, while trivial, nevertheless deserves notice to emphasize two points. The first is connected with organization, namely, that the Italian Army

Medical Service, as in some other armies, comes, for certain administrative purposes, under the *Intendenza Generale* (i.e., Adjutant General or Quartermaster General). I discovered that the headquarters for this branch was located at Treviso, some fifty miles down the line, and that passes to inspect medical establishments issue from the *Intendenza* at that point. Through a failure to be impressed sufficiently with this fact before leaving Rome, I had passed Treviso and gone direct to Udine, thereby precipitating a deadlock between two departments of the Italian Army, from which situation I had, perhaps justifiably, to suffer the consequences.

The second point is more obvious, namely, that it is wise never to proceed to a War Zone without all necessary papers, and a few more to be produced in emergencies.

Eventually, Captain Pirelli at Headquarters was successful in clearing away these difficulties. With him I made calls upon the local representative of the *Intendenza Generale*, General Zampolli, and upon the Chief of the Medical Service. At the office of the latter, I met the medical officer assigned to accompany me over the zone of the Second Army. With this officer, Captain Giannantonio Dotti, and his associates, Captain Giuseppe Tenaglia and Lieutenant Fernando Rietti, I went over the scheme of medical organization for the Second Army, and perfected the plans for inspections.

Up to the date of my visit very little had appeared regarding the accomplishments of the Italian Medical Service in this campaign. Lord Northcliffe had visited the Italian front shortly before, and had published his impressions, but no medical man had been enabled to form an opinion of the medical and sanitary achievements of this service.

By 1917, the Italian Army had reached a strength of approximately 4,000,000 men. For such a force nearly half a million hospital beds were required, and these had been provided, with all necessary equipment, from resources within the Kingdom, which latter fact explains, perhaps, why this stupendous performance had not attracted attention elsewhere.

GENERAL ORGANIZATION OF THE ARMY MEDICAL SERVICE

The Italian Army Medical Service is under the direction of an officer corresponding to our Surgeon-General, who had his headquarters in Rome in the Ministry of War. At the *Comando Supremo* in Udine there was a Chief Sanitary Officer for the Zone of War, and to him was decentralized from Rome the medical administration of the various armies at the front.

At Udine was located the depot of medical supplies and these supplies were distributed to the different areas from this point.

Each army had its chief medical officer who directed the medical work of the army, the proper coordination among the different armies being a matter of administration by the Chief Sanitary Officer at Udine.

The cooperation of the Italian Red Cross with the medical authorities was very active, and their relief work extended well up to the front lines.

MEDICAL ORGANIZATION, SECOND ARMY

The area of the Second Army was roughly triangular in shape, one apex of the triangle being at Udine, one at Caporetto, and the third at the level of Rubbia, just north of Gradisca.

The active front extended along the Isonzo from Caporetto south to about the level of Monte Gabriele, where it left the river, which turns here to the west, and continued on south to the Carso at the level of the positions won in the 1916 offensive.

The sanitary organization in the Second Army from the front lines to Udine, the main base, comprised the following points of relief:

1. Battalion and Regimental Aid Posts. (*Posti medicazione di Battaglione e di Reggimento.*)

These were the front line dressing stations, the most advanced points of relief, and were located in dugouts or trenches very near the fighting lines.

2. Infirmeries and Concentration Posts for Wounded. (*Infermerie e Posti Concentramento Feriti.*)

These were practically collecting stations for wounded.

3. Distributing Sections of the Sanitary Sections. (*Sezione o Riparto di Sezione di Sanità.*)

These were more elaborate dressing stations than the preceding units, and operated also as distributing points to the field hospitals. They could usually be reached by ambulance but were only a few kilometers behind the front.

At this level, or perhaps a little further to the rear, were the Red Cross Distributing Stations (*Ambulanza Autonom. C. R.*) and the Red Cross Mountain Ambulances (*Ambulanza di Montagna C. R.*).

These were the most advanced points reached by the Red Cross organization.

4. Field Hospitals. (*Ospedale di Campo.*)

The field hospital functioned both as a hospital and a distributing unit.

At this level also was found the Army Corps Sorting Office (*Ufficio di Smistamento di Corpo d'Armata*), which effected a further classification of patients before transport to the units in the rear.

The field hospitals were so placed as to be easily accessible from the front points of relief, as well as convenient to roads leading to the rear. Originally having but 50 beds, with the progress of the war they were greatly expanded.

5. Hospital and Distributing Units. (*Unità Ospedaliera o Riparto.*)

At Cividale, San Giovanni Manzano, and Cormons, the principal towns in the Second Army area between the front lines and the main base hospitals at Udine, were located the greater number of the hospital and distributing units.

Here also was the *Ufficio Smistamento d'Intendenza*, concerned with a further sorting out and classification of disabled personnel, by a coordinate branch of the Army.

As patients passed to the rear from this level the *Ufficio Sgomberi d'Intendenza alle teste di linea Ferroviaria*, still another branch of the Adjutant General's Department, arranged for the evacuation of certain categories of patients from the railheads at this level to hospitals further in the rear.

6. In Udine were located both General and Special Hospitals.

Among the latter were hospitals for officers; for ophthalmic-otological, stomatological, infectious disease, and venereal disease cases; the hospital for self-inflicted injuries; the hospital for prisoners; the neuropathic hospital, etc.

Including the special and general hospitals, the accommodations at this level provided 7,700 beds.

On the lines of communication in advance of Udine there were 23,510 beds, distributed as follows: At railhead in Cividale, Manzano, and Cormons, 11,700; in the Army Zone proper (*Corpi d'Armata*), 9,460 beds, and in the lazzaretti, 2,350 beds, making a grand total of 31,210 beds.

In both the Second and the Third Armies, Mobile Surgical Ambulances had been organized. These were placed well forward, so that certain classes of wounded, notably those with head, chest, and abdominal injuries, might receive skilled surgical assistance at the earliest possible moment. These units were in professional charge of prominent surgeons, and they had already done excellent work in active periods of fighting.

The Mobile Hospital "City of Milan" at Quisea, was in charge of Professor Baldo Rossi, that at Gradisca in charge of Professor Raffaele Bastianelli, and the one at Pieris, the Mobile Hospital "Province of Lombardy," was in charge of Professor Bozzi.

Professor Bastianelli had been kind enough to give me letters of introduction to Professors Rossi and Bozzi, but I was able to inspect only those hospitals located at Quisea and Gradisca. A more complete reference to these mobile hospitals will be made later.

LAZZARETS

A special feature of sanitation in this area was the provision of lazzaretti, or small hospitals for communicable diseases, interposed between the front lines and the base hospitals, with the object of caring for cases of cholera, cerebro-spinal fever, typhus, and small-pox.

A Disinfecting Section (*Sezione di Disinfezione*) was usually to be found in the neighborhood of each lazzaret, and each lazzaret was provided with a bacteriological laboratory.

There were six lazzarets, six laboratories, and five disinfecting sections in the area of the Second Army, either connected with the hospital establishments in the vicinity of Cividale, Manzano, and Cormons, or placed forward of these points.

I inspected a lazzaret at Albana which had a capacity of 400 beds. It was prepared to care for as many as four varieties of communicable disease. The ordinary exanthemata, such as measles, scarlet fever, etc., were not received here but were cared for in the infectious disease units of the larger hospitals at the railhead. This particular lazzaret at Albana was originally an ordinary country house, which, after a few alterations and improvisations, had been adapted for this purpose. It was arranged with the usual receiving room for patients; with appropriate facilities for bathing and delousing, and the disinfection of clothing; and with vats for immersion of clothing in disinfectant solutions. The patients, after treatment in the receiving section, passed to the clean side of the hospital, where they were provided with a sterilized hospital suit, or with their disinfected clothing, and were then assigned to a ward for treatment, detention, or observation, as the nature of the case might demand.

The bacteriological laboratories maintained in connection with lazzarets also served medical establishments in adjoining areas, and, in addition, supplied any sera, vaccines, etc., required for medical units further up the line.

TRANSPORT OF WOUNDED

In transport of the wounded from front line positions to railhead, motor ambulances of an excellent type were utilized.⁶ Many new roads had been added to those already existing in this area at the opening of the war, and, as these roads were in very good condition, this method of transport was both easy and expeditious.

From railhead at Cividale, and other towns at this level, ambulance trains were used in part to transport the wounded, but motor ambulances were also to be seen on all roads leading into Udine.

⁶These ambulances were described in a paper by the writer appearing in *The Military Surgeon* or *September*, 1920.

EVACUATION OF WOUNDED

The sick and wounded classified at railhead for hospitalization in Udine or for destinations in the rear beyond Udine, and intended to be transported to such destinations without hospital treatment at Udine, were arranged in the following groups:

(a) Those requiring a period of observation for detection of communicable disease before final release to treatment elsewhere, went to hospitals adjacent to the zone of war, or in the territorial zone. Upon completion of this period of observation and examination, they passed to hospitals either in the convalescent zone or in the territorial zone, according to the length of time considered necessary for full recovery.

Cases requiring from 15 to 30 days convalescence were forwarded to hospitals in the convalescent zone. Those requiring over 30 days for full recovery, and having a clear record as to communicable disease, were assigned to hospitals in the territorial zone, or allowed to go home to their families, after a review by an official board (*Giunta Sanitaria d'Armata*). Officers requiring similar review were passed upon by the Central Sanitary Commission in the Zone of War (*Commissione Sanitaria Centrale Z. G.*).

(b) Patients assigned to hospitals in Udine, when fit for duty, were returned to the front; but, if requiring a further and more prolonged hospital treatment, they were passed on to the convalescent zone, and disposed of as described under (a).

(c) The sick, wounded, and convalescents, as they recovered at the various hospital establishments in the rear, were returned to the front lines, many cases passing first to resting stations for a further period of recuperation.

NOTES ON SPECIAL HOSPITALS IN UDINE

Stomatological Hospital. (*Ospedale Folpe*.) Having been privileged to see the surgical and dental reconstruction work being done on the British Front, by Major Valadier and Captain Whale at No. 15 Stationary Hospital, Bologne, and that at No. 20 General Hospital, Camiers, by Major V. H. Kazanjian and his associates, it was most interesting to inspect this institution, and note resemblances and differences in technique.

Professor Perna was Surgeon in Chief of the Stomatological Hospital, which was located in a building formerly used as a private school. A description of the work done here in this special line of oral surgery would not differ materially from a description of similar work on other fronts. The results secured, judging from the cases I saw here, compared most favorably with any seen previously, and I was particularly impressed

with the ingenuity displayed in fashioning complicated dentures and splint apparatus.

A noteworthy development at this hospital was the hypodermic use of a morphine-lyoscine combination for producing general anesthesia. The advantages of this method for face and jaw work had commended it to Italian surgeons, chiefly, I imagine, because it left the operative field free of all interference from ether cone or other apparatus. It was stated that adverse effects from its use were seldom observed. It produced a condition of analgesia, similar to that of "twilight sleep," from the morphine-scopolamine combination, and patients were reported not to remember having suffered pain during an operation. For cases requiring very extensive dissections chloroform or ether anesthesia was substituted.

Neuropathic Hospital. (*Ospedale S. Osvaldo*.) This was a large hospital located just outside Udine, which received not only neuropathic cases, but also others, in a subdivision of the institution, representing a class not previously encountered in my travels in various war zones, namely, those termed "autolesionisti," or injuries self-inflicted by men aiming to secure exemption from military service, or obtain relief from such service, after being drafted into the army.

The number and variety of the lesions presented among the patients seen here was such that a full description of them would take me beyond the limits of this paper, and only a few of the more striking ones will be mentioned.

Several cases were seen with an upper limb swollen, ecchymosed and with the circulation in a condition of stasis. This condition had been produced by tying a cord about the arm high up near the shoulder, tightly enough to obstruct the venous return circulation, but not sufficiently tight to stop the arterial supply. Combined with this procedure, flagellation of the limb had been practiced repeatedly and persistently. The result was an incapacitated member, with chronic venous stasis, and considerable infiltration and thickening of the tissues. The condition required a variable length of time, often several weeks, before full recovery was reached.

The production of ulcers by application of strong acids or alkalies was a common expedient.

The injection of petrol (gasolene) into the subcutaneous tissue, producing a type of abscess very slow to close, was not unusual.

Obstinate contractures of limbs were also in evidence. Ordinarily, these contractures could be reduced, either with or without an anesthetic, but they returned promptly when the patient was sent back to the ward.

Perhaps the most extraordinary class of self-inflicted injuries was

that seen at the otological hospital in Udine. Here instances of otitis, of all grades, were seen, which had been self-induced by the introduction, into the ear, of various irritant or even corrosive substances. In a few cases the destructive process had been so extensive that no ear structures remained and one looked into a deep reamed out cavity. Some had involvement of the meninges, and a lethal ending from basal meningitis was the sequence in these cases.

Among the cases of otitis externa were some the result of the introduction of the juice of a species of euphorbiaceae into the outer ear. The juice of the *Euphorbia dentroïda* is known to have irritant properties, particularly in Sicily where it goes by the name *cammarone*. There is another species in northern Italy, where it is known as lattie or lattat.⁷

In forming an estimate of the relative importance of this class of self-inflicted injuries, it must be understood that the cases seen in this locality included all those assembled from the army area; otherwise an exaggerated impression of their prevalence might be deduced.

The staff of the hospital having charge of this class of cases were specialists in their peculiar sphere, and had become very expert in detecting malingering, and differentiating it from true disease.

Ospedale Contumaciale. The infrequent use of cavalry in the Italian campaign made a number of cavalry establishments available for other purposes. The cavalry had but one opportunity for action, namely, that at Pieris, early in the Isonzo offensive, and having failed to grasp it, it was destined to be employed in other duties.

One of the largest, if not the largest hospital, in Udine, was the Ospedale Contumaciale, formerly a cavalry barracks, but now adapted to hospital uses, and very successfully. It contained 2,750 beds, and a single immense ward had nearly 300 beds.

The chief function of this institution was to receive patients and detain them a sufficient length of time for systematic examination to detect carriers of communicable disease, and to care for such carriers if any were found. Each patient, before admission to a general hospital, passed through this examination either here or at some similar institution.

Men proceeding home on leave from suspected areas were also subjected to this procedure.

The principal examination was for cholera.

PREVENTION OF CHOLERA

The prevention of cholera in the Italian Army was a special feature of sanitation and disease prophylaxis which added a heavy burden to

⁷ Torrigiani, C. A.: Otitis Externa Diffuse (provocate con laticci di euphorbiaceae) Arch. Ital. d. Otol. Vol. XXVII fasc. 1 1916

medical administration. Cholera appeared among the Italian troops in 1915. In 1916 there were several hundred cases with about a hundred deaths. The infection was attributed to Austrian sources, presumably from trenches taken over by the Italians in their advances into Austrian territory. It is known that the Austrians had considerable cholera among their troops.

The measures taken by the Italians to prevent the disease assuming epidemic proportions in the army were the following:

- (a) Protection of the troops by the use of a prophylactic vaccine.
- (b) Detention and examination for carriers.
- (c) General sanitation of trenches, camps, hospitals, etc.

The anti-cholera vaccine was administered every three months, in three injections at seven-day intervals. The average dose was 6,000,000 organisms. The reaction to the vaccine was said to be mild and rarely incapacitating.

The examination for carriers involved a week's detention. After a bath, and the passage of clothing through the sterilizer, the candidate for examination was placed in a detention group. The first stool was received in a sterile utensil containing a metal tag with a number stamped on it, for purposes of identification. The utensil with contents then went to the laboratory. Here a small section (half an inch) of sterile glass tubing was dropped into the utensil, removed with contents by sterile forceps and dropped into a test tube containing peptone broth, and then incubated for six to eight hours. The amount of the sample was regulated roughly by using the glass tubing as described.

From the incubated mixture smears were made on Dieudonné's medium (alkaline blood agar), and incubated over night. The colonies appearing were picked out, stained, and the specimens examined microscopically.

It was stated that in the vast majority of cases this test sufficed to determine whether the man was a carrier or not, but where doubt existed, confirmation was sought by making subcultures, or by resort to agglutination tests.

The immense amount of detail work imposed by the requirement that all men returning from the front, and leaving the war zone for home, be detained and examined in this manner, may be realized when it is stated that in this hospital alone, the record showed 43,000 such examinations since the procedure was initiated. The results proved, however, that detection and isolation of carriers, combined with hygiene and vaccination, sufficed to make the menace of cholera negligible.

PREVENTION OF VENEREAL DISEASE

Another acute problem confronting the medical authorities in this campaign was the control of venereal disease.

Earlier in the war no system of control was operative, and at the end of the first ten months venereal diseases had increased to such an extent that the army authorities were forced to adopt measures of supervision and regulation. General charge and direction of this division of preventive medicine was placed in the hands of Major Ferdinando de Napoli, a well-known specialist, to whom I am indebted for information regarding the general features of the anti-venereal disease movement in the Second Army.

Officers and men were granted leave and permission to pass out of the war zone only during the inactive winter period, and since the organization for venereal disease prevention did not extend to areas beyond this zone, the curve of incidence for this class of disease rose markedly after the leave period.

Individuals appearing with venereal disease acquired within the war zone were questioned as to the source of the infection, and from the data thus obtained a special report was made to the Anti-Venereal Section of the *Direzione di Sanità*. If this report indicated the source of the infection, the Health Officer of the town where the disease was acquired was promptly notified, often by telephone or telegraph, and directed to locate, if possible, the individual prostitute responsible, and place her under treatment in hospital where she remained until cured. Such detention and treatment was obligatory under the law.

All prostitutes in the war zone were registered, and each was required to carry, and produce upon request, a card or record of medical inspections. Inspections were made weekly by the local health officer. No irregular or clandestine prostitution was permitted in the war zone.

As a result of these measures, vigorously applied, Professor de Napoli stated that the incidence of venereal disease in the Second Army had fallen to a very low level, and that the only deterrent to a more complete success was the annual leave, during which men went beyond the zone of war to the cities where control lapsed for the time being.

It should be noted that all men proceeding on leave were first examined for the presence of venereal disease.

A venereal disease prophylactic packet had been devised by the medical authorities concerned with this subject, which presented some novel features.

The prophylactic packet (*scatola antivenerea*; antivenereal box) was in the shape of a small cardboard box with three compartments. One compartment held a collapsible tube of soap; another a tube of calomel paste (*pasta del Metchnikoff*), and the third pledgets of gauze pinned together with an ordinary pin, and six compressible gelatin

capsules of oval shape, containing a silver salt. These capsules contained a sufficient quantity of solution for one injection, and were made ready for use by piercing the small, elongated end with the pin, inserting the small end into the meatus and injecting the contents into the urethra by compressing the elastic body of the capsule.

The directions printed on the box called for a preliminary cleansing by means of the soap and gauze, then injection of the silver salt, and finally rubbing in of the calomel paste. The liberal use of the latter, preliminary to coitus, was also recommended.

MOBILE SURGICAL UNITS

The Mobile Hospital "City of Milan." At the time of my visit to the Italian front, this hospital was located at Quisca, a small town about five miles to the northwest of Goritzia. Professor Baldo Rossi, the chief surgeon of the hospital, was not present on the day of my inspection, but his assistants courteously demonstrated the principal features of its construction and operation. No general activity prevailed at this season of the year and the hospital was comparatively empty, but this condition had this advantage, that it enabled one to acquire a better idea of constructional details and organization than would have been possible in an active period.

In this locality permanent buildings had been utilized to house the staff and to care for much of the equipment not required in the quiescent interval before the spring offensive, but the following data, secured from Prof. Rossi's assistants, represents the hospital as it would have been constituted when in full operation.

The mobile surgical hospital "City of Milan" was a special field hospital with a capacity for 100 wounded. It comprised the following divisions:

(a) An operating room tent, measuring about 15 by 18 feet, with double walls (wood inside, waterproof canvas outside), and a flooring of wood covered with linoleum. This tent had ample window space for natural lighting, and acetylene gas for artificial illumination. The gas for this purpose came from the automatic generator on the motor truck, and was preferred to an electric installation as furnishing a steadier light for operating, and was, moreover, less expensive in first cost and in operation than an electric plant. It also involved transporting less weight than would be the case with an electric outfit.

To the operating tent was joined:

(b) A tent with a floor area of about 15 by 24 feet, with three compartments, one for preparing patients, one as a surgeon's preparation room, and one for sterilizing instruments and dressings:

- (c) A tent for disrobing of the wounded;
- (d) A number of ward tents;
- (e) A tent for dressings and other medical supplies;
- (f) A tent for troop personnel, mechanics, chauffeurs, etc.

There were 48 beds in this tent;

- (g) Officers tent, divided into ten compartments;
- (h) A tent for volunteer nurses;
- (i) An X-ray tent;
- (j) A tent for temporary isolation of communicable disease; and
- (k) Five auto-trucks and three motor cars. (For transport of unit.)

The entire hospital could be unloaded and made ready for work in six hours, and it could be taken down and reloaded on the trucks in four hours.

The more essential units of the hospital, namely, the operating room, the preparation room, and the patients' disrobing room, could, if circumstances demanded, be joined to other buildings, or to a sanitary section, these latter serving as wards, and thus a complete hospital would be constituted. This was considered the preferable arrangement, as permanent buildings were more desirable in this climate for the wounded than tents.

Since it was considered important during operations to have the walls of the operating room free from vibration, these were constructed of wooden panels, covered on the outside with waterproof canvas. The interior finish of the walls was white enamel paint, which gave a surface easily cleaned, and one which tended to increase the interior illumination.

Natural lighting was obtained from windows, which extended the entire length of one wall and one-half the length of the two side walls. The window space was about three feet wide. For operations at night, three powerful acetylene lamps furnished artificial illumination.

The furniture was of both metal and wooden construction which could be readily folded to permit of easy transport.

Besides the surgical outfit proper, operating tables and other movable accessories, there was a sterilizer, with fourteen instrument chests; a laundry outfit with two ironing machines; a sterilizer for clothing; and a complete X-ray outfit. This latter apparatus was mounted on a separate truck.

The personnel of the hospital consisted of a Chief Surgeon with the rank of Major in the reserve, six assistant medical officers, three medical students, a chaplain, ten professional nurses, four volunteer nurses, fifteen chauffeurs and mechanics, and nineteen enlisted men, making a total of fifty-nine.

The six assistant medical officers were all selected from the surgical staffs of important civil hospitals. In the case of this Mobile Hospital, they were mainly from the hospitals of Milan. Three of these officers were permanently attached to the hospital, while the other three came from the territorial or reserve force, and served for terms of two months, when they were replaced with another set of officers from the reserve. Under conditions of inactivity, such as prevailed at the time of my visit, the reserve officers were assigned to a base hospital, although subject to call should their services be required here. This arrangement avoided the undesirable feature of retaining all the surgeons in the Mobile Hospital during periods of restricted activity, when the work could easily be performed by the three surgeons permanently attached.

A similar rule prevailed with respect to the Chief Surgeon, who, during periods of suspended military activity, returned to hospital service at the base, or in one of the cities.

The main function of the mobile hospital was to take station as near the firing line as practicable, receive and treat the more serious non-transportable wounded, until they could be evacuated to the hospitals in the rear. It should be noted that the hospital aimed to provide not only for the necessary operative work, but also for the post-operative treatment of severe injuries, chiefly those of the head, chest and abdomen. It sought to bring to these classes of wounded, as near the firing line as possible, the same surroundings, the same perfection of equipment, and the same training and organization of surgical personnel that were available in the large civil hospitals in the rear.

From a point on the road a short distance from Quisca we looked down upon the city of Goritzia, and in the near distance rose the now celebrated Monte Sabotino. Although Goritzia had been occupied by the Italians since the previous August, the Austrians still dominated the city and the surrounding plain from positions on the hills to the eastward, and from these positions they occasionally bombarded the city and also certain sections of the road leading to Quisca. For this reason, and also because my pass limited my movements to the west bank of the Isonzo, I was not able to have a closer view of Goritzia, which I was anxious to have for sentimental reasons, so we turned back at this point to take up the return trip to Udine.

All over this area the small villages had suffered severely from bombardments, and the stucco buildings were in various stages of wreckage. Colonel Santucci, the chief medical officer of the area, who accompanied the party, showed us several field hospitals located in buildings which had undergone a process of successful restoration after bombardment. The stucco construction lent itself readily to a repara-

tive process since the materials were always at hand, and to restore the buildings was mainly a question of labor. The buildings inspected appeared as if quite new, and their smoothly finished walls and white-washed floors gave a pleasing impression of cleanliness and order. It could hardly be realized that they were formerly in the condition of the shattered structures one saw here and there in the immediate neighborhood.

On the return journey to Udine we stopped at Villa Trento, near Dolegnano. Villa Trento had been converted to hospital uses, and was now occupied by the British Red Cross Unit operating with the Italian forces. This unit was in charge of Dr. Brock of Rome, and with him was associated Sir Alexander Ogston and Mr. George M. Trevelyan. These gentlemen very kindly conducted our party over the hospital, which was admirably equipped, and doing splendid work. Those who have read Mr. Trevelyan's interesting account of his experiences in the Italian campaign, will recall what severe trials befell this unit during the retreat of the Second Army succeeding the Caporetto disaster of October 20, 1917.

The mobile hospital at Gradisea, of which Professor Bastianelli was chief surgeon, was in the area of the Third Army, and since my papers were endorsed solely for the Second Army, it became necessary to obtain the additional permission before I could proceed. This was arranged from the local *Intendenza Generale*, and I was soon on the road, with Lieutenant Devescovi acting as my guide and associate.

Upon arrival at Gradisea we met Doctor Egidi, a member of the staff, who very kindly showed us about the hospital buildings, and explained the organization and administration. Here, as at Quisca, military activity was at low ebb and consequently the hospital work was at a minimum. Doctor Egidi took us to the top of the main building from which we had a fine view of the surrounding country, particularly Monte Nero, and where we could easily see Austrian shrapnel bursting along the tops of the high ridges across the Isonzo.

Since to describe this institution would be largely a repetition of what I have previously written about the unit at Quisca, I will close with the statement that the Gradisea unit had already won a well-deserved reputation for the high character of its work under the skillful direction of its chief surgeon, Professor Bastianelli.

I had now to consider the question of an inspection trip to the mountain fronts which General Zampolla kindly offered to arrange. But it developed that the mountain roads were buried deeply under a recently fallen snow, and it would take days to make them passable. In view of the indefinite delay which would be entailed by waiting for

the roads to be cleared I felt compelled to decline the trip and return to Rome.

There was also an additional consideration which urged my return to London at this time and that was the critical political situation developing between the United States and Germany, which was shortly to result in the declaration of a state of war between the two countries.

I am indebted to General Zampolla, Colonel Barbarich, Captain Pirelli, and the other officers at General Headquarters who contributed so much toward making my visit to the Italian front both interesting and profitable.



ETIOLOGY AND PREVENTION OF INJURIES TO THE EYE¹

By MAJOR HARRY VANDERBILT WÜRDEMAN

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In times of peace the army surgeon deals with the same class of injuries from the same causes as those which happen in industrial occupations;—the army, as now constituted, embracing practically all trades and professions, the accidents being similar to those of civil pursuits. In addition to these, *in times of war*, there are many more serious injuries due to the effects of high explosives, shrapnel, bullet wounds and traffic injuries, most of which are more severe and are attended by extensive wounds of other portions of the head. Therefore, it behooves the army surgeon to become fully cognizant of the causes and prevention of ocular accidents.

Certain industrial occupations involve particular risk to the eye by accidents, acquired diseases and intoxications. Each trade has its own eye diseases and particular forms of trauma and, in some, the relation of the ocular damage to the risk encountered is very great, indeed. In many States and countries the law requires safety appliances which have materially reduced the number of workmen laid up by reason of accident and disease, and have been recognized by employers as money-saving propositions.

A very large proportion of injuries occurring in trades happen to the eyes, possibly as many in number as all other injuries. *In actual warfare*, as a consequence of trench fighting, high explosives of terrific detonating power, of the fact that the head of the soldier is not only the most vulnerable part of the body, but is the most exposed, the proportion of injuries to the eyes is raised to a hitherto unprecedented number.

The *iron and steel trades* expose the workmen to cuts, burns, bruises and flying bodies, in a larger proportion than in others. Most of these are trivial injuries, but many are as severe as those seen in war. Besides these dangerous trades, are those of machinery, butchering, building, mining, fire and heat, where the workers are subject to flying foreign bodies, splashes and burns. *In agricultural pursuits* there are many kinds of injuries, especially from foreign bodies by straws, branches, farming implements and working about cattle, canterization from spraying of trees. In *building trades* there are injuries from splinters of wood, iron and stone particles and from instruments; in quarries and

¹Lectures to class of Army Medical School, Washington, D. C., May, 1921. No. 1.

mines, from explosions of powder and dynamite; in laboratories, from foreign bodies of stone, burns and scalds, splinters of glass and chemical burns; in glass-blowing, burns and formation of cataract, etc.

Generally the injury is inflicted by fragments flying off while the mechanic is striking a chisel or piece of metal with a hatchet, hammer or other tool, and it is generally the portion of the tool that breaks off which causes the injury; chipping and fettling and dressing of metal and stone without protective glasses or screens; breaking of glass in glass and bottle works. Contusions happen to all classes and are especially common from major accidents. In *domestic life* the serious accidents happen by the kitchen stove from splashing of hot liquids, from the use of curling irons, from children playing with knives and other sharp objects and especially, in boys, from air-gunshots. The sports of football, baseball, boxing and archery give rise to many serious accidents, similar types of which are to be met with in Army Service. *Certain forms of injuries* are more apt to happen to some parts of the eye than others, such as cuts and gashes upon the lids, globe, cornea and ciliary regions. Perforating wounds may go from the corner and sclera through the bulb into the orbit and optic nerve. Lacerations, wounds from bites and horns of animals occur upon the more exposed parts, while shot wounds affect all portions of the eyes, orbit and contiguous structures. Flying foreign bodies or motes are usually found under the lids, although the patient generally rubs the eye and impacts them into the cornea. Contusions and heavy injuries of the eye may cause tearing of the retina and chorioid, may push the lens or retina away, causing detachments. Heavy contusions even break the eye open. Burns and cauterizations, as a rule, affect only the outer structures—the lids, cornea and conjunctiva. Electrical burns and exposure to sunlight may affect the lens and retina.

Objects causing ocular injuries: All substances which come into contact with the surface of the cornea may cause erosions, such as the fingernails, straws and twigs; cuts of the eye obtained from sharp instruments, such as knives, shears, glass and thin points of metal; piercing wounds from sharp instruments, sharp points of metal, wood and glass, such as pins, awls, knives, pieces of wire and nails. Instruments which are pointed but not especially sharp, such as daggers, swords, sabers and bayonets, cause lacerated wounds and gashes. Larger, blunt objects, such as canes, pencils and sticks, may likewise lacerate the eye. Contusion wounds are caused by sharp or blunt pieces of iron, wood and other stuff, stones, horns and hoofs of cattle and beaks of birds. Bite wounds, such as from animals.

Foreign bodies either remain superficial or go deeply into the eye or

orbit. In industrial injuries, where pieces are broken loose from objects with great force, such as happen in the machinery and iron trades, mining, explosions of powder or dynamite, breaking of retorts or bottles, firing of cartridges, etc., the foreign body may go deeply into the structure of the eye or even through it in the orbit. Bullet and shrapnel wounds, as a rule, implicate the structures of the face, bones of the head and cranial contents, but even here spent bullets may go no further than the eye itself. Contusions occur from blunt or round objects, as a rule, of large size; falling on furniture, blows of fists, instrument handles, etc.; or from objects thrown with some force, as stones, baseballs, snowballs, corks, glasses, etc. Burns are caused by the flame itself, sun or electric light, hot metal and ashes, burning gas, hot steam, oil, etc. Cauterizations may be due to molten metal, acids, alkalies, lime burns, arsenate of lead, etc. To all of these injuries *secondary infections* come, more particularly the streptococcus and staphylococcus which are constantly at the edge of the lid and sometimes in the conjunctival sac.

Weak sight itself predisposes to bodily injuries as well as those to the eye. *Diseased and abnormal eyes* react poorly to healing of injuries. Traumatism itself may be the exciting cause of a syphilitic iritis or a keratitis. Infected wounds have the characteristics of other wounds, combined with loss of tissue from ulceration due to necrosis. *The infection* may be carried by the object producing the injury, by accompanying foreign bodies, exposure to the air, contact with fingers, unclean instruments or bandages.

It is remarkable that the eyes, whose combined surface is only about 1/375 of the surface of the body, should be involved in approximately 8 per cent of all injuries; but the explanation lies in the constant exposure of the head, especially of the eyes, in modern work and warfare. The *outcome* of industrial injuries often depends on how and when the first attention is given, for failure to close and cover the perforated wound of the eye may be as responsible for the ensuing infection as the injuring foreign body.

The number of men who have become partially or completely blind, as a result of wounds, is very large. While the humanitarian interest in the question is, of course, uppermost, the economic side is not to be lost sight of. Anything which will aid in reducing the number of these unfortunate cases, is of special interest at this time. The authors of a recent article have analyzed 698 cases of *eye wounds in warfare*. They show that of this number, 303, or 43.4 per cent of the wounds, were produced by very small fragments of different kinds of missiles. Of 341 shell wounds, 170, or about 50 per cent, were produced by small fragments

and from grenades and bombs an even higher percentage. If we take into account the proportion of ocular wounds in comparison with the total number of wounded, and the number of ocular wounds which may be prevented by a protecting apparatus, we will be able to understand the advantage which can be found in an ocular protecting apparatus.

Can the visual system be protected against the injuries caused by projectiles? It seems that this protection can be realized if one does not pretend to make it absolute. No portable sheathing will be sufficiently efficacious against penetration of rifle balls hitting the head right away, as it is quite necessary to have a protecting apparatus not too heavy to be worn. The same observation applies to fragments coming from large shrapnel. On the other hand, there are many wounds—almost half of the ocular wounds—for which protection may be obtained by means of a metallic wall made of zinc or lattice susceptible of resisting penetration of small fragments, and perhaps medium fragments if the latter have already passed through a certain distance. The efficacy generally recognized of the protection afforded by the helmet is also a relative efficacy. An important decrease of the skull-penetrating wounds has thus been obtained. For the visual system, it is also this relative protection that we want to obtain. The problem may be easily solved if it were only a question of the protecting factor, but the fighting man must keep his whole visual acuteness, or at least have it but slightly modified by the protecting apparatus placed before the cornea. The visual field must not be manifestly narrowed. As to the medium or small fragments hitting tangentially the visual system after passing through the eye or the temporal region, a barrier may easily be established. One can also guard against the small and medium fragments which reach in front of the eye, but one must make use of means which have, more or less, the inconvenience of lessening the clearness of the vision to such an extent that one may, strictly speaking, adopt a relative solution consisting in the obstruction of the temporal-orbital-nasal region by a protecting plate perforated with an orifice a little larger than the cornea. The vulnerable zone would be thus restricted by three-quarters. It has been recognized that some form of protection of the eyes would reduce the number of cases of blindness. In other words, inasmuch as roughly 50 per cent of all eye wounds are produced by tiny fragments, there should be some practical method of prevention.

The protection of eyes is furnished by a slotted visor which is raised when not in use and when lowered covers not only the eyes but all the upper face. The slits in the visor of the model are wider than it is intended to have them in the manufactured helmet, for the reason that

they were cut by hand and were spread in the cutting. The helmet proper is of one piece of metal and all superfluous parts have been eliminated. In the regulation French helmet there is a slit in the top for ventilation. In the model submitted, ventilation is provided around the headband as in a tropical pith helmet. Moreover, where the usual helmet is exceedingly uncomfortable, this one has an arrangement of springs underneath the headband, which permits it to fit the head comfortably.

Diagnosis of Injuries to the Eye. The diagnosis of injuries to the eye is made by subjective and objective examinations, of which the history, symptomatology, and the visual acuity, field, condition of the ocular musculature and the refraction are given their proper consideration.

Objective examination by direct and focal illumination, the ophthalmoscope, diaphanoscope, sideroscope, magnetic attraction and the X-ray offer exact means of diagnosis.

A careful history should be obtained, giving the date and hour of the accident, the character of the work and surroundings, the instrument concerned, object or foreign body causing the lesion, and, in special cases, the names of the witnesses to the accident; also the character of attempts to remove a foreign body, and whether or not the case has been attended by a physician, are facts that should be elicited. Remember that, while the interests of the patient are of prime importance, we should be guarded in our prognosis, as it depends very largely upon previous injuries and the character of the first dressing. We should never give an opinion reflecting upon the first consultant, or as to the liability of the employer, for these are theories that the lawyers may be allowed to fight about and the courts decide. The less we have to do with the legalized human parasites who are in the habit of soliciting personal damage suits, the better it is for the physician, and we should not furnish information in advance upon which a personal damage or malpractice suit might be based.

Usually an examination may be conducted without a local anesthetic, as cocaine or holocaine, but such are frequently needed to subdue irritability, adrenalin to lessen congestion, and cocaine, homatropine, euphthalmine, or atropine for mydriasis. The visual acuity, and in some cases the visual field, muscle balance, duetion and versions, the refraction, etc., should be ascertained. In fact, in medico-legal cases a full examination should always be made, and sketch drawings or water colors may be made, as well as full notes taken. The literature of the subject should be looked up, as then the examiner, as a medical witness, will be fully prepared for his answers in court. The demeanor, willing-

ness of the patient and actions of his companions should be noted as thereby hints as to malingering may be ascertained.

The examination of an injured person from a medico-legal standpoint should be conducted in a sympathetic manner in order to obtain the patient's confidence, and while the examiner should ever be on the watch for malingering, yet he should not take an antagonistic stand. Such an examination is often grudgingly submitted to, the patient looking upon the examiner in the light of an opponent who has been hired by the defense to find some excuses for prevention of the collection of damages.

The opposite frame of mind is shown by those injured persons who themselves secure an examination as a basis for malpractice, or personal injury suit. Yet they, too, invariably distort and magnify the importance of the economic damage.

It behooves us, therefore, in examination of injury cases, to leave no impression upon the patient as to the advisability of his seeking recourse at law, but to conduct the examination in an impartial and sympathetic manner, at the same time leaving a favorable opinion upon his mind.

A comparatively small proportion of accidental injuries have, in American law, a basis for collection of damages; the larger number have been worked up for pecuniary rather than eleemosynary purposes. Be this as it may, one should not lose sight of the fact that cases occur in which there are really grounds for damages and which should obtain pecuniary relief thereby.

Owing to the transparency, translucency, and delicacy of the ocular structures a number of *special methods of examination* are of help, of which general inspection by direct and reflected light should first be used.

Objective Examination. Inspection by direct illumination by daylight, electric light or reflecting mirror is first made. The skin, lids, cornea, conjunctiva, puncta, lacrimalia, etc., are observed. Then the retrobulbar folds and undersurface of the lids are brought into view by eversion with the fingers, but preferably by pushing down the retrotarsal folds by a smooth instrument, as a small glass rod, handle of an instrument, or cotton-tipped stick, as it is here that most diseases of the conjunctiva are prominent and foreign bodies may be impacted therein.

Many small and otherwise almost indistinguishable abrasions of the corneal epithelium, wounds and small foreign bodies in the cornea, may be brought into view by the staining of the tissues with a 2 per cent fluorescein and 2 per cent bicarbonate of soda solution. This

aniline dye will not stain the intact corneal epithelium, but readily passes into the subjacent parenchyma and abraded epithelial cells, forming a bright green background upon which foreign bodies are readily perceived.

Magnification of the eye by a lens, preferably by the Berger or Jackson binocular loupe, is of great value.

Focal illumination in the dark room is ordinarily carried out by focusing the light upon the eye by a large loupe. The use of the diaphanoscope for this purpose gives, however, a much better illumination, as the light is confined to a narrow beam. The author's transilluminator is the size of an ordinary fountain pen and is as readily handled.

The ophthalmoscope should first be used at a distance of a couple of feet from the eye and magnification obtained by use of a $+3.00$ to $+16.00$ lens in the instrument, the patient being directed to look in various directions, whereby a foreign body may be brought into view against the red background of the fundus; approaching closer to the eyes, after the cornea and anterior chamber have been examined in this manner, the lens, vitreous, and fundus are then successfully investigated. The electric ophthalmoscope with light regulated by a rheostat gives the most elastic means of such examination. Diaphanoscopy is a means of rendering the eyeball luminous, whereby the shadow of the ciliary body, iris, tumor, or large foreign body within the eye may be observed. I have a number of times determined the presence of foreign bodies which were at first indiscernible by other methods behind the iris, in the lens or in the fundus, by this method.

The sideroscope, if properly made and mounted, will determine the presence of a foreign body, but it must be magnetic, and the accuracy with which you are able to locate foreign bodies within the eye often varies from 1 to 3 cm. "The instrument is a marvel of delicacy, but to handle it requires the patience of a saint."

The giant magnet will reveal the presence of magnetizable pieces of steel and iron by causing traction within the eye, varying from a drawing sensation to decided pain on approach of the eye to the magnet. The foreign body may likewise be drawn into view, or the eye may adhere or curve forward toward the magnet if the body be sufficiently large. Such a method of examination is, however, somewhat dangerous, on account of the foreign body, while approaching the magnet, acting as a missile and tearing structures that might not have been previously injured. In such examination the eye, needless to say, should not be anesthetized.

The increasing use of magnesium and nickel steel renders the number of nonmagnetizable foreign bodies somewhat larger in proportion than previously.

The exact determination of the existence, position and size of foreign bodies within the globe has only become possible since the advent of the Röntgen rays.

As the frequency of injuries to the eye from flying copper increases in number each year, due to more extended use of that metal, largely from the increased use of electricity, the value of *accurate radiographs* becomes more apparent.

In a series of experiments to determine the degree of penetration of the X-rays to various substances, such as glass, marble, granite, cement, etc., Sweet placed particles of these substances in the inner canthus of a cocanized eye. The size of each was approximately $2 \times 2\frac{1}{2}$ mm. The result shows that all of these substances can be made visible if proper technique be followed. The figures show the density of shadows of each materials, the exposure being the same for all materials, coal being the only one used that failed to demonstrate a shadow of any usefulness.

Accidental injuries to the eyes may be imitated by the patient putting in medicinal or irritative substances or wounding or otherwise causing actual injuries to his own eyes (self-inflicted damage), or, what is more commonly the case, alleging loss of sight or other function or liability to use the eyes, or painful affections (simulation), or overstating the degree of damage to the function of sight (aggravation)—all of which classes under the generic term of malingering.

More difficult to determine are those cases where the existence of accidental lesions is apparent in which the injured party claims greater functional damages than actually exists in the individual. A number of observations should here be made in order to determine the proper relations.

Protective Devices for the Prevention of Injuries of the Eyes: While many eye accidents are unavoidable, yet the large majority are preventable by due care of the patient, parents, fellow-workmen or employers.

Safeguards against accidents to workingmen have been forced upon the attention of the manufacturers, transportation companies and others, not only by legal measures, but by the necessity for conservation of their own goods and machinery, the loss of service, the cost of care and expense in treatment of such workingmen, as well as protection from damage suits which give lawyers lots of work. The policy of making factory work safer and more healthful is profitable as well as humane and it makes the workmen more contented.

Safety appliances are in use in most dangerous trades, and, according to the twelfth census, have markedly decreased the proportion of accidents within the last ten years. Laws compelling such devices, with compensation and insurance laws, have been enacted in 31 States of

the American Union, Alaska, Hawaii and the Panama Zone and 22 foreign countries. The installation of screens for iron chippers and bottle workers, the pneumatic fan at the grinder's wheel, the forced wearing of masks, spectacles or other eye protection where flying chips of metal, glass, stone, etc., are common, has reduced the number of accidents. But though these materially insure the safety of the workmen, it is with reluctance that he uses them and will shirk their application unless carefully watched and continuously warned. Even if protectors hang alongside of the grindstone, they are rarely used.

Workmen generally complained about the wearing of goggles and protectors, which is compulsory in most bottling works in the United Kingdom, although there has been no deterioration of vision from their use, in a number of cases, headaches and dizziness were reported on inquiry. I was surprised at the opposition to glasses until I found that the workmen all complained that the dust and sweat blurred the lenses from the start and later the emery cut the glass so that they were in danger of a more serious injury from blurred glasses than would be inflicted on the unprotected eye by the emery. This opposition seems hard to overcome, and while a foreman or skilled workman, who has to go to the wheel occasionally to sharpen his tools, takes measures to protect his eyes, the average workman is either too careless and shiftless to take the trouble to keep the lenses clear.

The illustrations for this lecture were specially taken for this purpose, having been obtained by me through the courtesy of the Carnegie Steel Co., the Duquesne Works, Edgar Thompson Works, Homestead Works, Clairdon Works, Farrell Works, Carrie Works, Lucy Furnaces, Howard Axel Works and Upper Union Mills. Also through the courtesy of the Delaware, Lackawanna and Western Railroad, the Hard Coal Mining Company, the latter of whom have gotten out a book for the instruction of the employees, who are called together from time to time for lectures on "The Prevention of Accidents connected with their work." The Carnegie Steel Company is now using photographs and lectures for the same purpose. Other illustrations have been obtained from Sheffield, England, Milwaukee, Baltimore, Seattle and other places. These amount to several hundred in all, 48 of which have been reproduced for purpose of this lecture and some of which are now reproduced in book form by P. Blakiston's Son and Co. in a work on "Occupational Diseases and Accidents."

The following pictures were shown:

1. Workmen grinding edged tools. (Sheffield, Eng.)
2. Workmen at emery wheel, sharpening tools, showing signs. Men at emery wheels should at all times wear goggles even if the wheel has a permanent guard. (Lucy Furnaces, Car. Steel Co., U. S. Steel Co.)

3. Men at boring mill provide themselves with goggles, as at any time a chip is liable to injure the eye. (Duquesne Works, Car. Steel Co., U. S. Steel Co.)

4. Babbitt Metal. Men pouring Babbitt should wear wire mesh screen entirely covering the face, as at any time an explosion is likely to occur. (Duquesne Works Car. Steel Co., U. S. Steel Co.)

5. All men working around pig-casting machine should protect their eyes by wearing goggles. (Car. Steel Co., U. S. Steel Co., Lucy Furnaces.)

6. Masks fitted with proper glasses to prevent injury to eyes in using electric burner. The face is also covered by the leather cover. (Car. Steel Co., Duquesne Works, U. S. Steel Corp.)

7. Foundrymen using oxy-acetylene burner to cut sink heads from roll. On account of bright flames, he at all times wears suitably colored goggles. (Car. Steel Co., Homestead Works, U. S. Steel Corp.)

8. Electric welding, wearing head mask with colored glass apparatus (deep violet). (*World's Work*, March, 1918)

9. All Bessemer steel blowers should wear suitable colored goggles for the protection of their eyes from the bright flame. (Car. Steel Co., Homestead Works, U. S. Steel Corp.)

10. Furnace men, and especially open hearth furnace men, should all at all times wear suitably colored goggles for the protection of their eyes. (Car. Steel Co., Duquesne Works, U. S. Steel Co.)

11. Wooden goggles used to prevent snow blindness in Alaska.

12. Pair of Goggles, both glasses covered with splashes of metal. A man saved his sight by wearing these. (Nat'l. Com. for the Prevention of Blindness, New York City.)

13. Three pairs of goggles. "These goggles were worn by men at the plant of the Youngstown Sheet and Tube Co. and were the means of saving the sight of wearers. Your future depends upon your eyes. (Nat'l. Com. prevention of Blindness.)

14. Don't try to repair your goggles.

15. Copper mining with compressed air apparatus.

16. Coal mining. Miner preparing cartridge with lamp on head. (Del., Lackawanna & Western R. R.)

17. Coal mining. Powder exploded, Miner injured. (Del., Lackawanna & West. R. R. Co.)

18. Coal mining. Thawing dynamite. (Del., Lack. & West. R. R. Co.)

19. Dynamite exploded. Workman injured. (Del., Lack. & W. R. R. Co.)

20. Coal mining. The first hole has missed fire and instead of waiting twenty minutes and reporting to the drift boss, the miner puts in another charge. (Del., Lack. W. R. R. Co.)

21. First charge goes off while miner is inserting second cartridge. (Del., Lack. & Western R. R. Co.)

22. Wire mesh glass guard on water gauge glass to protect boilermen from injury, especially injury to the eyes. (Homestead Works, U. S. Steel Corp.)

23. Workmen bottling aerated waters. Wine and beer bottling machines are similar. Screen between bottling machine and workman and others who wire bottles. (Sheffield, England.)

24. An emery wheel equipped with heavy steel guard. Guard on pulley and belt, and permanent William George Glass guard to prevent injuries to eyes. (Carnegie Steel Co., Edgar Thomson Works, U. S. Steel Corp.)

25. Chip guard. "a homemade guard easily attached to any glove prevents flying chips." (Nat'l. Comm. Prevention of Blindness.)

26. Machine Shop. Workmen using the movable burlap screen while chipping a piece of steel at bench vise. (Car. Steel Co., Upper Union Mills, U. S. Steel Corp.)

27. An open hearth charging machine with wire mesh flash guard which works in conjunction with charging level. (Car. Steel Co., Homestead Works, U. S. Steel Co.)

28. Angle steel wire mesh guard at blooming mill rolls to prevent scale and cinder from flying. (Car. Steel Co., Duquesne Works, U. S. Steel Corp.)

29. Guard on rip saw to prevent operator being injured by saw and to prevent dust from striking his eyes. (Car. Steel Co., Homestead Works, U. S. Steel Corp.)

30. Hot saw in beam mill thoroughly guarded to prevent sparks from flying through mill, to the injury of the workmen. (Car. Steel Co., Homestead Works, U. S. Steel Corp.)

31. Steel shield in high speed axle lathe to prevent shaving from striking operator's face or eyes. (Car. Steel Co., Howard Axle Works, U. S. Steel Co.)

32. The Foster steam hammer guard, being a shield to prevent piece of scale from flying and injuring other workmen. (Car. Steel Co., Clairton Works, U. S. Steel Corp.)

33. Man who works at the rolls of a blooming mill, wearing a mask of fine brass netting intended to protect his eyes from flying scale when a piece goes through the roll.

34. Old-style dangerous way of closing blast furnace cinder notch, placing the operator in grave danger from flying cinder. (Car. Steel Co., Lucy Furnaces, U. S. Steel Co.)

35. The "Bates" blast furnace cinder notch automatic stopper which is operated by workmen at safe distance. Point of this instrument is water cooled. (Car. Steel Co., Furnaces, U. S. Steel Corp.)

36. The Berg automatic mud-gun for stopping iron tapping hole or blast furnace. No men need be nearer than 30 feet. (Just before automatic shot.) (Car. Steel Co., Carrie Furnaces, U. S. Steel Co.)

37. The Rankin asbestos board electric switch guard to prevent injuries to eyes from a flash. This also provides means to lock the switch when open. (Car. Steel Co., Clairton Works, U. S. Steel Co.)

38. The "Miller" safety electric switch box. Open. Fireproof and flash-proof. Switch can be locked "open." (Car. Steel Co., Clairton Works, U. S. Steel Co.)

39. Open-hearth steel pouring crane cab with steel shutters to protect operator in case of an explosion. (Car. Steel Co., Farrell Works, U. S. Steel Corp.)

40. Concrete coke dust bin which prevents the blowing of dust into the air to the possible injury of workman's eyes. (Car. Steel Co., Clairton Works, U. S. Steel Co.)

41. Good illumination is an important safety principle. 250 watt tungsten lights on the jib crane assure plenty of light which follows the load. (Car. Steel Co., U. S. Steel Co.)

42. Blacksmith's shop. Bench showing tools in badly burred condition. These tools, and any tools which a blacksmith may be preparing, should be dressed on head as well as face. (Car. Steel Co., Edgar Thompson Works, U. S. Steel Corp.)

43. Oyster shuckers in Baltimore. They are subject to corneal ulceration due to the lime from injury by pieces of shell. Picture taken March, 1913. R. L. Randolph, M. D., Bulletin, Johns Hopkins Hospital.

44. The mote remover. A very dangerous practice which should be absolutely forbidden and which causes much infection when injured. Report at once to the Emergency Hospital. (Car. Steel Corp., Duquesne Works, U. S. Steel Corp.)

45. A very dangerous practice of some machinists is to strike a file or high tempered tool with a steel hammer. Pieces are liable to fly and injure eyes. (Car. Steel Co., Homestead Works, U. S. Steel Corp.)

46. Miner's nystagmus. Position of miner following seam of coal lying in a constrained position, eyes turned upwards. (Del., Lack. & W. R. R.)

47. Mine boss workman inspecting roof of tunnel. Eyes turned upwards (Del., Lack. & W. R. R. Co.)

48. *The Story of an Accident.*—The foreman having hired a new man, presents him with a pair of goggles and explains to him the danger of the occupation. (Car. Steel Co., Duquesne Works, U. S. Steel Co.)

49b. The workman proceeds to work opposite a companion who is using a pneumatic chipper and is struck in the eye by a chip, having neglected to use glasses and placed them in his pocket. (Car. Steel Co., Duquesne Works, U. S. Steel Corp.)

50c. His companion is now much disturbed and ready and willing to aid, but is himself guilty inasmuch as he neglected to use a burlap screen. (Car. Steel Co., Duquesne Works, U. S. Steel Co.)

51d. Nurses are at hand day and night at Emergency Hospital ready to treat all injuries in the best sanitary manner, and in grave cases a surgeon is always within call. (Car. Steel Co., Edgar Thomson Works, U. S. Steel Co.)

52e. The workman comes from the Emergency Hospital, with the probable loss of an eye, all from the cause of his companion. Glasses still remain in his pocket (Car. Steel Co., Duquesne Works, U. S. Steel Co.)

53. Man with eyesight destroyed and face badly disfigured by lime burns. (Natl. Com. on Prevention of Blindness.)

54. Peddler who was made blind by 2 accidents. A piece of steel flew into one eye and a blow from a falling brick destroyed the other. Man makes \$3.00 a week by selling shoe strings, whereas, formerly, he earned \$15.00.

55. Is he happy? Yes. He wore goggles while chipping in the foundry yard and saved his eye when a chip flew from casting and struck him. (Dr. Shanklin, Indiana, Md.)

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(The above have been extensively abstracted for this lecture. For specific references see same.)

AMERICAN RELIEF WORK IN SERBIA¹

BY MAJOR EDGAR ERSKINE HUME

Medical Corps, United States Army

Formerly Lieut. Col., U. S. A. and American Red Cross Commissioner to Serbia)

IN February, 1919, I was ordered to proceed to Belgrade, Serbia, to have charge of the American medical work in that part of the Balkans. I was on duty at the time at Vicenza, Italy. It was with the greatest difficulty that I learned anything of how to go to Belgrade. That part of Serbia had for so long been cut off from the Allies that even the Serbian officer with the Italian G. H. Q. could give me no assistance. Finally I blindly set out in a generally eastward direction towards Triest and Fiume, where I arrived after a three days' trip. Fiume had not at that time become so well known, nor had d'Annunzio begun his career there. The French controlled the railroads in the former Hungarian territory, and though no regular trains were running they were occasionally sending a sort of mixed train as far as Zagreb, the Croatian capital. I was able to secure a compartment in the only coach, an ancient third-class carriage with a badly leaking roof and no window glass or lights. Fortunately I kept my baggage with me in the compartment, for, as I afterwards learned, I would never have seen it again otherwise. The journey required three days, as the train stopped at every small station, the stops often taking an hour; but no one was allowed to leave the train, which was always supposed to be just ready to start. As usual in Balkan travel, the food needed on the journey had to be carried along. In Zagreb I learned that ordinarily no trains were running to Belgrade, but that a freight would probably be sent during the next week. I fortunately got authority to travel in this way, and after 48 hours discomfort arrived in Zemun, the town across the Save river from Belgrade, and historically interesting as the scene of the first shot fired in the war. As the railroad bridge had been destroyed during the war, I crossed by ferry and arrived in Serbia.

Several members of the commission had already arrived, having come by boat from Salonica and by rail from the coast, and living quarters and office space had been secured.

A few words as to Serbian history may not be out of place. Certain other European countries, e.g., Spain and Italy, are protected by great northern mountains and elsewhere by the sea, but Serbia has only rivers for boundaries. Through her territory lie the great paths from the

¹Read at the 29th Annual Meeting of the Association of Military Surgeons of the United States at Boston, Mass., June 2-4, 1921.

orient to the occident and through these have passed the great oriental invasions of Europe. Witness also the Berlin to Bagdad railway of the Germans. Alone of European nations, except mountain-protected Switzerland, Serbia has no outlet to the sea. On this account Austria-Hungary received most of the Serbian trade and was thus in a position to dictate to the little state. A large part of the Serbian race lived in certain provinces of the former Austrian empire, and it was the growth of Pan-Slavic feeling, especially Pan Southern Slavic feeling, that made Austria decide to crush Serbia.

Five hundred years ago the Turks entered Europe and conquered Serbia, the crowning disaster of Serbian history being the battle of Kossovo in 1389, when the flower of their race fell by the irresistible sword of the Moslem. Thereupon the Serbs sank into a deep sleep of 400 years, during which they, however, managed to dream of their former greatness, their bards (*guslari*) ever singing ballads of the exploits of their national heroes, Tzar Dushan, Milosh Obelitch, Kralyevitch Marko, and others. Strange as it may seem, the national holiday is the anniversary of the defeat of Kossovo, and the youth of the land was never without the reminder that it was his duty to try to assist in freeing Serbia of the presence of the Unbeliever. Their church, a part of the Holy Orthodox Eastern Church, had been allowed to exist; for true to Mohammed's precepts the Serbs had been offered the choice of the faith of Islam, the sword, or tribute. They chose the last, and in their darkest hours their faith sustained them. One small group of the Serbian race never lost their liberty. These were the natives of the Black Mountain, or Montenegro. Besides these, the Serbs of the Dalmatian coast, though not independent, lived under less severe masters, the Venetians, and through them were brought into touch with the west.

At the opening of the seventeenth century the Turks ceased to be a dominant military power, and the trend of aggression turned from westward to eastward. The rising power of Austria pressed forward on the retreating Musselmans, so that she obtained control of northern Serbia, and continued to hold a large number of Serbs in her domain until the World War. Thus in the eighteenth century the Serbs found themselves divided between the imperial systems of Austria and Turkey. But the age of great changes had begun. If the war for American Independence pointed the way for the French Revolution, none the less surely did the latter awake an echo in the distant Balkans. An appeal was made to the Sultan Selim III, who, mindful of the treaty of Kutchuk-Kamardji (1774), by which Russia had been made the protector of the Orthodox subjects of the Porte, granted them a limited form of self government and

religious liberty. However, the Sultan was far away, and the Janizaries, who were on the spot, showed no inclination to comply. Conditions grew intolerable and seeing no hope in distant protectors, the Serbs, first among the Balkans to so do,¹ raised the standard of rebellion. A leader equal to the occasion came forward. This was George Petrovitch, better known by his Turkish name of Kara George (Black George), the grandfather of the present king. Though an illiterate peasant he had seen something of war in the Austrian service, and to his ability to hold the loyalty of his fellow Serbs and his undeniable genius for irregular warfare Serbia owes her present freedom. So thorough were his successes that by 1807 northern Serbia was freed from the Turks. However, his early victories were overshadowed by Turkish successes during the next ten years, so that he was forced to flee to Austria. Then under the leadership of Milosh Obrenovitch, Serbia's second liberator, who combined oriental cunning and lack of scruple with his courage, fighting continued until 1839, when the Sultan by treaty of Adrianople was forced to recognize Serbian independence. Thus the tiny peasant state began its existence with Milosh as its prince. During the succeeding years the throne was held sometimes by a representative of the Obrenovitch dynasty and sometimes by the house of Karageorgevitch, the antagonism of the rival families keeping Serbia in a constant turmoil. This ended in 1903, when Alexander, the last of the Austriophile Obrenovitch princes, was assassinated under circumstances all too well remembered, and Peter Karageorgevitch, the present ruler, was offered the throne.

By a league with Bulgaria and Greece, Serbia (and Montenegro) were able to drive the Turks out of the Balkans in 1911, though a subsequent war with Bulgaria, who demanded the lion's share of the reconquered territory, could not be avoided.

Serbia's magnificent rôle in the World War is too well known to require more than passing mention. When, in 1914, a large Austrian force was dispatched against the little kingdom, the nations of Europe, if they even gave the Serbians any thought in those first war days, expected to see them driven backwards through their country and finally be forced to capitulate. Instead of this, Serbia offered a resistance that astonished the world. Three times the enemy crossed her frontier and penetrated the interior, but each effort ended in failure. After a four months' siege, Austria captured Belgrade only to hold it thirteen days. At the close of the year there was not an Austrian

¹ Greece without the aid of the Powers could not have achieved her liberation and the Bulgars owe their liberation to Russia, but Serbian freedom is the work of the Serbs themselves. In memory of this there are placed four S's (in Serbian C's) around the cross on her coat-of-arms meaning "*Samu Srbija sebe spasela*," "Serbia alone delivered herself."

soldier on Serbian soil, or as Field Marshal Putnik more accurately said, there was not an Austrian soldier at liberty. There were in Serbia 70,000 Austrian prisoners. Though the dual monarchy now offered excellent terms, the Serbs declined to buy peace at the cost of abandoning their Allies. It was at this juncture that the typhus epidemic began. Suffice it to say here that within six months 150,000 deaths had occurred, the mortality having been from 30 to 70 per cent. Besides this a new danger now menaced Serbia. Just four days after the fourth German-Austrian attack on northern Serbia (this time under Mackensen) Bulgaria invaded Serbia. The Serbians were now caught in a death trap. The most liberal estimate of 250,000 Serbs (including many hundreds not fully recovered from typhus) had to face 300,000 Austrians and Germans, and more than that number of Bulgars. There was also the uncertainty as to what Greece would do. Serbia held out against these odds for two months, but the end had come. The army was collected around the historic plain of Kossovo of tragic memories. Nothing was left but to quit their country and retreat through Albania. Some great poet should write as his masterpiece the tragedy of the Albanian retreat. The country through which they had to retreat was the Albanian Alps, the most savage and inhospitable region in Europe. There being no roads, only mule trails, all their guns, motor vehicles, wagons, and the greater part of their horses and oxen had to be sacrificed. I have seen hundreds of wrecks of this sort in the valleys near these mountains whence they were hurled to prevent their falling into the enemy's hands. The Albanians, whose only profession had for years been pillage and war, were armed by the Austrians and carried on a pitiless hunt for Serbian victims. Exposed to intense cold, hunger, savage warfare, and the terrible thought of leaving their homes perhaps forever, the horrors of those days will always be remembered by the Serbs as one of their greatest sufferings for their native land. And yet even amidst these trials the chivalry of these people was so innate that hundreds of British and American women, who had been doing work among them, could walk hundreds of miles through a harassed retreating army and fleeing peasantry through a disorganized and strange land and yet fear no evil (Admiral Troubridge).

The army of sick and dying men finally arrived at Vallona and embarked for Corfu, on which beautiful island it slowly recovered its strength so that in the following spring and summer (1916) units began to leave for the Salonica front. Here they formed a part of the allied force, their operations continuing until the Bulgarian armistice. With the succeeding downfall of the Hapsburg monarchy, all branches of the Serbo-Croatian race were able to unite to form the new Yugoslav state, officially called the Kingdom of the Serbs, Croats, and Slovenes.

To aid this new kingdom of old peoples had come the American Red Cross Commission, our work being obviously more needed in war-stricken Serbia than in the other states which had not known invasion. There was a separate unit for Montenegro. Though there were frequent changes in our personnel, the commission consisted of about 50 medical officers, 100 nurses, 10 sanitary corps officers, 10 dental officers, and about 75 other persons. About half of the medical and dental officers were detailed from the Army, the rest being employed by the Red Cross. Of this number three men died of typhus and one of blackwater fever.

The problem of assisting Serbia was so enormous that one hardly knew where to begin. Despite the usual opinion in America, the country was not starving, though there were many isolated districts where food was very scarce. There was, however, a terrible shortage of clothing. The people, except in Belgrade and one or two of the larger towns, had depended in the past almost entirely on homespun clothing, and with the loss of their sheep and goats during the war they were almost without means of supplying these needs. The few shops that contained shoes or outer clothing asked prices that even the wealthiest people could hardly pay. The suffering, especially among the children, was extreme. Many were clothed only in rags and almost all were barefoot. Numerous were the makeshifts for footgear, including scraps of old leather, auto tires tied on with strings, rags, bits of bark, etc., after the fashion of the *opanka* or national footgear.

However, the greatest need of Serbia was for medical assistance. Prior to the war it was said that Serbia had approximately 340 physicians, but during the two Balkan wars, the subsequent difficulties in Albania, the World War and great typhus epidemic of 1915, about 80 per cent of the medical profession had perished. A few Croatian, Czech, Greek and Russian medical men had come into Serbia later, but as far as could be ascertained at the Ministry of Health, there were about 200 doctors for the entire country of three and a half million inhabitants. This included military surgeons as well as civilians. The army still being mobilized, the conditions in the out-of-the-way communities were very bad. For example, the town of Prilep, the center of a district with a population of about 190,000, had no hospital facilities at all and only the part-time services of a physician who divided his time between this and another centre.

Medical supplies were almost not to be had. Even the Army had for some time been without anesthetics.

The Serbian sanitary authorities, both civil and military, were found to be anxious to cooperate with the commission and to render any assistance in their power. So much had been accomplished by the

Sanitary Commission under Dr. Strong in 1915 that the people now expected the Americans to perform almost miracles.

One great difficulty was encountered at the outset. Serbia was "over-missioned." Besides several small "organizations" whose personnel consisted of two or three well-meaning ladies with little skill and less supplies, there were representatives of the American Red Cross, the American Relief Administration (Hoover), the Serbian Relief Committee of America, the Friends Service Unit, the American Women's Hospitals and five or six British organizations. The resources of these organizations varied. At the beginning, no American agency had any supplies except the Red Cross and the American Relief Administration. The other American missions arrived later and at first, at least, were dependent on the American Red Cross for supplies, transportation, etc. An attempt was made to bring representatives of these bodies together and form a sort of working agreement so that there would be no overlapping of work either as to character or geographical distribution. A tentative agreement was reached but as the Serbian authorities preferred not to exert any influence in the matter, it was usually found that an organization not caring to follow the policies or plans that had been adopted, went its own way regardless, often thus diminishing the good results obtained. Much of this, on the part of American organizations at least, could have been avoided had the central Red Cross authority approved of a recommendation early made, to the effect that those organizations which received almost their entire equipments and supplies from Red Cross sources, should in return have been required to do work in accordance with the policy adopted by the Red Cross in the Balkans. In this respect the 1915 commission had the advantage of the commission of 1919-20.

Nevertheless a fairly satisfactory working agreement was reached and the British relief organizations decided to undertake work chiefly at Nish, the largest town in central Serbia and in the villages in this zone, which the American Red Cross was to assist northern Serbia, with headquarters at Belgrade and southern Serbia (Macedonia) with headquarters at Salonica. Certain of the other organizations intended to do special work and took station accordingly. For example, the Friends took over a large farm near Leskovatz where modern agricultural methods were taught; the Y. M. C. A. opened rooms in Belgrade chiefly for the students of the University; and the Salvation Army brought in clothing to be sold at reasonable prices to persons dependent on small fixed salaries, who in a way, owing to the unprecedented prices and depressed exchange, were suffering more than some of the so-called poor who were receiving relief from foreign sources.

After consultation with the Ministers of War, Interior, Public Health, and Child Welfare, it was decided to undertake the following work:

(1) Anti-typhus work and the establishment of medical relief stations at certain centers, the character and work of which will be described below.

(2) The establishment in Belgrade and other cities of sewing rooms to assist in making clothing. The materials, sewing machines and an American directress for each being supplied by the American Red Cross, the Ladies' Charity Sewing Societies, of which there are several in every Serbian town, agreeing to supply workers at their own expense, who should, however, be furnished with rations by the commission. At the close of the commission's work the machines were to remain the property of the various societies. These undertakings were highly successful and at once began to relieve a great want.

(3) The operation of a factory at Belgrade (with sub-center at Nish) for the manufacture of artificial legs. Though late in starting owing to the difficulties in securing materials and workmen, this undertaking finally proved one of the most valuable pieces of work done in the Balkans. On account of the greater need the work was confined to making artificial legs, though in a few special cases, artificial arms were made.

(4) The maintenance of orphanages in certain centers. Serbia even more than Belgium deserves the name of the "Land of Orphans." Institutions were placed in some of the larger towns in which no orphanages existed, and where these were already open, they were, in many cases, assisted with supplies. Care of the fatherless being considered in Serbia as the most important of all charities, there was perhaps more ready cooperation in this endeavor than in any other that we undertook.

(5) The Austrian and German prison camps and hospitals at Leskovatz, Palanka, Chuprija, etc., and the Bulgarian camps at Vranje, Skoplje and Bitolj were in a miserable condition and were probably the most important foci of the typhus outbreak of 1919. Our medical officers and nurses undertook the work of delousing and cleaning up the camps and managing some of the hospitals with the results given below.

(6) The University of Belgrade not being able to open its doors for instruction on account of the lack of quarters for the students, a summer camp was maintained by the American Red Cross while the work of reconstruction was being carried out in the city. Thus the University was able to function a year sooner than would otherwise have been possible. In this way a number of students who had completed a

part of their medical work in Austria, and who had for the most part been interned there during the war, were able to finish their education and begin to practice their profession and thus fill a great want.

(7) There were very few dentists in Serbia and in fact the Dental Service of the Serbian Army was said to consist of but one man, and he, in accordance with continental custom, being a surgeon as well, was always occupied by other and "more important" duties. The dental work through the country consisted simply of extracting all offending teeth, with results obvious. In each of our clinics a dental officer was on duty. In addition two large and completely equipped dental ambulances were used. An ambulance could be placed on a flat car and thus sent by rail as far as the railroad extended, and thence go under its own power to some central village to which patients could easily come. Owing to the poor roads and the national Serbian mud, these ambulances, which were quite heavy, could only be used in good weather.

(8) A motor X-ray outfit was used in the same way, going from center to center. There was no X-ray equipment in the entire country except in Belgrade.

(9) A public health laboratory under two Sanitary Corps officers was equipped and operated at Monastir, and routine diagnostic work, water examination, etc., was carried out for this part of the country. The laboratory was later taken over by the Serbs. There was already established a laboratory in Belgrade in connection with the Civil Hospital and another was maintained by the British at Nish.

(10) An attempt was made to assist in the opening of a nurses' training school in connection with one of the two large hospitals in Belgrade, cooperating with the Serbian Red Cross Society. This work, however, being included in the program of the League of Red Cross Societies it was not pushed, though each medical station did as much as possible towards training local nurses. Popular opinion had much to do with making this difficult. Nursing was thought to be beneath the better class of girls and the others had not the necessary education or ability. This feeling was much stronger in those parts of Serbia that had been but a short time freed from the Turks.

The difficulty in obtaining supplies will be readily appreciated. There were, prior to the war, but three trunk railroad lines in Serbia, and the only one connecting Belgrade with Salonica and the sea was out of commission and could not be expected to function for many months, for the enemy had destroyed every bridge and much of the track. A second railroad from Salonica to Monastir was in operation so that by having supplies shipped to the Greek port by steamer from French and Italian ports, our stations in Macedonia could be supplied. The

supplies for north Serbia had to be transported by rail across France, Switzerland, Italy and Croatia as far as Zemun, whence by boat they were brought over to Belgrade. From Belgrade the north Serbian stations were supplied partly by the very irregular and uncertain Danube boat service and partly by motor truck for the inland stations. In the worst weather only ox carts could travel over the semiliquid roads so that often the entire animal transport of a village had to be requisitioned in order to supply the station's wants. At first gasoline was fairly easy to obtain from Italy, where the American Red Cross had an excess after closing their operations in that country. However, later it became almost unobtainable except from the Salonica representatives of a large oil corporation, who made us a "special" price of about \$1.50 per gallon—quite maddening in view of the abundance of high-grade and cheap gasoline in nearby Roumania, from which we were cut off by the political situation. A few months before the commission's work closed we were able to secure gasoline at a very low price from Roumania, it being brought up the Danube by barges. With the beginning of the long-drawn-out discussion regarding Fiume (called Rieka by the Jugoslavs) it became impossible for us to bring supplies across Italy and thenceforth the trains were sent via Vienna and Buda Pest.

The most important medical work consisted in cleaning up certain typhus foci and conducting about 22 medical centers.

As typhus was not present in all parts of the country and as travel conditions were so difficult, it was hoped that the disease would not spread in epidemic form to all parts of the country. The pandemic of 1915 had left the surviving population with a high degree of immunity, and as military permits were required for travel from one town to another, it was not very difficult to almost isolate affected communities. In cases of necessity, persons who had been properly bathed and their clothing and baggage disinfested were allowed to leave. As satisfactory delousing stations were established in different towns, this became more easy.

No attempt will be made here to go into the details of the anti-typhus work, for the methods were those used by Dr. Strong's Commission in 1915 and have since been often described and used. In general the plan consisted of disinfestation of the people in the badly infested districts, house to house inspection and removal of cases to hospitals, disinfestation of the inmates of the houses, etc. Our commission had prepared a series of posters in Serbian, explaining the mode of transmission of typhus, etc. These were drawn by a Serbian artist and were all the more valuable as the persons depicted are in the Serbian

costume.³ These drawings were conspicuously posted in each town hall, post office, boat or railroad station, military headquarters, prefecture, etc. I was told by a priest in the mountains near Bitolj that many of the inhabitants had never seen any colored pictures except the *ikons* in the churches, so that these posters were in some way associated in the popular mind with religion, a fact that made them all the more useful as a means of popular education.

The hospitals that we found in Serbia were, with the exception of those in Belgrade, unworthy of the name, though some of them had formerly been quite creditable institutions. Even in the capital a systematic effort had been made by the retreating Austrians to damage all appliances beyond repair. The Commanding Officer of the Military Hospital of Belgrade, Colonel Sondermeir (sometime Surgeon General) and the Director of the Civil Hospital, Colonel Soulbottitch (a surgeon of international note and an Honorary Member of this Association), in showing me over their institutions, pointed out that every water, sewage and heating pipe had been broken, every autoclave and stove demolished, practically all windows smashed, etc., and absolutely all medical supplies carried away or destroyed. With the help of hospital and other supplies from the Red Cross and the allied armies, these institutions were soon repaired to a certain extent and able to receive patients.

In the interior there had been hospitals before the war in the chief towns but with almost no exceptions they were now mere shells. But few had beds at all, though there were, in some, clumsily constructed wooden boxes containing straw. An attempt was made to supply material and additional personnel for the more important of these hospitals and the work of cleaning and partially outfitting them was one of the first things undertaken. By far the worst was the hospital at Palanka. This was largely filled with Austrian prisoners suffering from typhus. There was not a single bed in the building, which formerly accommodated about 80 beds. The patients, dressed in the remnants of their uniforms, were lying on the floors without even straw. Only about one in three had covering. The physician in charge was himself convalescent from the disease and unable to do much work. The floor of the mortuary was covered with dead, there being no one to remove them. The utter wretchedness of the patients cannot be described. The hospital was without any means of sterilizing clothing. The patients received the same ration as the Serbian Army, which was

³ The Polish Commission afterwards requested these drawings for use in Poland after translating the legends. However, it probably would have been better to have made new drawings showing the Polish dress.

very small indeed. The danger of entering such a place as the Palanka hospital cannot be exaggerated. Although every precaution was taken, including the wearing of typhus suits, with rubber gloves and boots at all times when in the building, etc., two of our nurses contracted the disease, though fortunately both recovered. Our personnel here consisted of two medical officers and four nurses assisted by a doctor sent by the Serbian authorities. A disinfecter, hospital beds and bedding, pajamas, medicines, etc., were supplied by the American Red Cross, and the hospital in a short time was able to properly care for the patients. Similar work was carried out at Pirot, Shabatz, Pozarlievatz, Vranje, Leskovate, Chuprija and Kavadar.

At the medical stations in the towns where the epidemic was not present, a dispensary was opened and the distribution of clothing placed under the direction of the medical officer in charge. Food was not distributed as a rule except to patients, nursing mothers and a few others, as this problem was being looked after by the American Relief Administration. As soon as a building could be secured, a small hospital was opened. However, in those towns where hospitals had existed prior to the enemy's occupation, our efforts were turned towards reopening these institutions where they were not (as at Gjevgjelli) beyond repair. News of the presence of the American doctors and nurses spread with incredible rapidity and soon the out-patient service had far more work than could be done with our limited personnel. Patients made three or four day trips on foot to reach one of the towns in which a Red Cross dispensary was located. The beds in the hospitals, averaging about 30 in each, were filled at all times and the convalescent patients able to be removed, were transferred to the homes of the ever hospitable townsfolk, some of whom received an allowance of food in return. The personnel of the stations consisted usually of 3 to 5 medical officers, 4 to 6 nurses, one dental officer and usually one or two relief workers or persons in charge of supplies. The number of medical personnel varied with the needs of the locality. Often the number of medical officers had to be reduced on account of typhus in some other community. At all times there was a far greater demand for nurses than supply. Wherever there was a Serbian doctor in the town, he was consulted and the nature of our plans explained. In all cases patients able to pay for their medical attention were sent to the Serbian physician, in case of doubt the local authorities deciding the question. The Serbian medical profession was, as a rule, well trained, for the most part being graduates of Vienna or the German Universities, more rarely the Russian Universities. I recall only two graduates of French and no graduates of British or American Universities. Considering the isolation of these

men, they were remarkably efficient. The University of Belgrade had formerly given only the first two years of medicine though now the full course is offered.

Fortunately the warm weather was coming on before the Serbs who had been prisoners of war in Austria, Hungary, Bulgaria and Turkey began to return. These men, many of whom were ill or convalescent, were released without money and almost without clothing and had to make their way as best they could to their homes on foot. For weeks they lined the roads of Serbia. They were given food by the authorities in the various towns through which they passed, but as a rule slept in the open—a thing not ordinarily considered a hardship in the Balkans. Had it been the season for typhus the country would no doubt have been exposed to another epidemic, for these conditions would have been ideal for the dissemination of the infection. Later, when the Austrian, Hungarian and German prisoners in Serbia were released, followed somewhat later by the Bulgars and Turks, the railroads were in operation and no such problem faced the country.

However, the downfall of the counter-revolution under Kolchak and Denekin, the survivors of the Russian Volunteer Armies, who had withstood the Bolsheviki to the last minute, began to enter the Balkans. On board British and other transports they left Odessa, first attempting to land at one of the Roumanian ports on the Black Sea and then at Varna in Bulgaria, but permission was refused and they were sent to Constantinople. Here those actually suffering from disease were taken ashore and the rest sent to Salonica, where they were permitted to land on condition that they go at once to Serbia. The Serbian authorities provided trains and sent them direct to Belgrade. Such was the disorganized state of affairs that these refugees arrived in the Yugoslav capital almost unannounced. On account of the lack of quarters in the city, the refugees had to go across the Danube to the town of Pancevo, where they were given an old Hungarian school building as a barrack. This first party consisted of about 750 persons, for the most part officers and their families, including also about 200 cadets (between the ages of 14 to 19) from the Military Academy at Odessa. Practically every person was infested with lice and several, hardly recovered from typhus, had actually got out of bed to escape from the city which was about to be occupied by the Bolsheviki. There were a number of cases of the disease among them, besides those who had been sent ashore at Constantinople.

The American Red Cross having been given the necessary authority by the Ministry of Health, undertook the work of disinfesting the Russians who had already arrived and assisting them with such food

and clothing as could be spared and, still more important, to disinfest the others who were expected to arrive in Salonica shortly. With this end in view, a delousing and quarantine station was established at Gjev Gjelli, the town at the Greco-Serbian frontier through which all trains from Salonica to Belgrade passed. This town having been almost entirely demolished by the Bulgarians, a number of tents had to be provided. Later, as parties of Russians began to be permitted to land in Bulgaria and enter Serbia via that country, a similar station was operated at Pirost on the Bulgaro-Serbian border.

One of the greatest problems facing the Balkans today, especially Serbia, is the care of these Russian refugees. They are being given employment as fast as possible. The medical men are particularly welcome as are also the Army officers, many of whom have entered the Serbian service. Large numbers of the others are going to Croatia and Slovenia. It must be remembered that the Russian refugees in the Balkans are some of the best of their nation, and practically all of them are under Bolshevik proscription. In the first party that arrived in Belgrade alone numbered a general, three lieutenant-generals and many other high ranking officers of the military and naval services as well as of civil life, besides numerous persons of title and distinction. Among others may be mentioned the General who had been in command at Port Arthur during the Russo-Japanese War, the General who had commanded the victorious Russian army in Galicia early in the World War, the President of the Duma, a former Governor-General of Siberia, several bishops, and others. Even an aunt of the Tsar fared but little better than her compatriots. Serbian hospitality was never better shown than in their treatment of these unfortunate patriots. They were even allowed to exchange their rubles for Serbian dinars at a much higher rate than that current on the bourse, the Russian Legation undertaking to control the practice to prevent any abuse of the privilege.

At about the same time a number of Czecho-Slovaks and Poles who had been serving in Siberia, arrived in Serbia and were given the same assistance as the Russians, though the problem in their cases was not difficult as in a short time the Czecho-Slovak and Polish military Missions were able to arrange for their transport to their countries.

In the summer of 1920 the American Red Cross Commission was withdrawn, the need of assistance having passed, though certainly much additional work might have been done. The Junior Red Cross and certain other organizations still, however, continue their child welfare work.

Before concluding I should like to add a few words as to the Serbian character. Western Europe and America have heretofore received their

information as to the Serbs and other Balkan peoples via Vienna, and it has always been to the interest of the Dual Monarchy to picture these small states as made up only of illiterate and savage peasants, who, holding human life of small value, live by much fighting and little work, having no history, ideals, culture or refinement. While a student at a German university I remember hearing this idea frequently put forth, and with a limited knowledge of the underlying reasons, was often at a loss to account for the hostility towards this little nation, especially manifested at the time of the Balkan wars, and the days just prior to the declaration of the late war. As a matter of fact the Serb, like his cousins of the other Slavic nations, is of a sensitive, highly emotional nature. He is serious, thoughtful, religious and, above all, patriotic. No more hospitable, kindly, grateful and generous people could be found, and I believe that every American who has had occasion to visit their country before, during, or since their late war sufferings, will bear me out in this. A favorite Serbian proverb is:

"Better a body in rags and a soul in silk
than a soul in rags and body in silk."

MENTAL EXAMINATIONS OF ALIENS AND THEIR BEARING ON THE POTENTIAL MILITARY STRENGTH OF THE NATION¹

By P. A. SURG. H. V. WILDMAN, JR., U.S.P.H.S.

DURING the war great numbers of young men of military age were withdrawn from their usual pursuits and placed under strict and unaccustomed discipline with the result that new mental conflicts were aroused. Upon the ability of any individual to adjust these conflicts depended his usefulness to the military establishment and to the nation. Many of these soldiers and sailors (especially drafted men) were either aliens or of alien descent. The question naturally arises as to their suitability for military service as compared with those of native parentage; also as to the bearing of the mental examinations of arriving aliens on the future of national defense.

The experiences of the war have shown that individuals suffering from even mild grades of mental defect are a detriment to the military establishment. While many of the borderline cases were retained in the Service, the evidence shows that in any subsequent conflict the best interests of the government would be served by their immediate discharge once the presence of mental deficiency was established.

The great numbers of aliens coming to this country renders immigration a matter of vital importance to our national life. The information obtained as the results of examinations of the male population of draft age, accentuates what we already knew; namely, that all possible emphasis should be placed on the exclusion of aliens with mental and physical defect. Examinations for the purpose are conducted by the Public Health Service at all domestic ports.

During these examinations every effort is made to evaluate the mentality of each individual and to detect such defects not only because of their bearing on his ability to compete in civil life, but because of the possibility of his being called upon to serve with the colors.

CAUSES OF IMMIGRATION

Movements of populations from one country to another are mainly due to economic causes. They take place usually from the more densely to the less densely populated countries, from those of lower to those of higher standards of life, and from those of lesser to those of greater economic opportunities.

¹ Read at 29th Annual Meeting of the Association of Military Surgeons, U. S., Boston, Mass., June 2-4, 1921.

While political and religious causes affect these movements of populations, under modern conditions they are only of minor importance. Political causes, however, have an important bearing on the willingness of the future citizen to defend the country of his adoption, for it is well known that disgruntled peoples in their migrations sow the seeds of discontent in other lands. It is all the more important, therefore, that the arriving alien should be physically and mentally fit to compete with others in his new environment and thereby develop a spirit of willingness to render public service in time of need.

Prior to 1815 immigration to this country, though insignificant, was homogeneous and attributable more largely to political considerations. Following the second war with Great Britain the economic opportunities in the United States attracted greater attention, and at a time when there was much distress in Europe following the Napoleonic Wars.

CHARACTER OF IMMIGRATION

In the one hundred years from 1820-1920 approximately thirty-three million aliens have reached our shores. From 1820 to 1882 immigration was only in moderate amount. Modern immigration, therefore, dates from 1882 to 1914, between which years a vast change has occurred not only in the amount but in the character of arrivals.

Whereas during 1882 about 86.9 per cent of the total immigration from Europe had come from northern and western countries and only 13.1 per cent from southern and eastern countries, in the last-mentioned year 19 per cent came from northern and western and 81 per cent from the southern and eastern countries. The northern and western countries comprise Belgium, Denmark, France (including Corsica), German Empire, Netherlands, Norway, Sweden, Switzerland, United Kingdom (England), Ireland, Scotland, and Wales and the United Kingdom not specified. The southern and eastern countries comprise Austria-Hungary, Bulgaria, Portugal (including Cape Verde and Azores Islands), Rumania, Russian Empire, Spain and Turkey.

By 1914 this proportion had further increased, about 15.3 per cent of the total immigration from Europe having come from the northern and western countries. Disregarding national lines, the immigration of southern and eastern races now comprise the bulk of all aliens arriving in this country.

Public sentiment in the United States appears to favor selection rather than restriction of immigration, there being little objection, until recently, to a considerable amount if of good quality physically and mentally. The experience had during the war, however, plainly indicates that in the interest of national safety it must be assimilable both

in character and numbers. The belief that the limits of safety have actually been exceeded is evidenced by the enactment, within a few days, of a law restricting the numbers who may come from any particular country to 3 per cent of the foreign born from that country now here, and by the public concern over communistic tendencies among foreigners as well as their influence on race development.

MENTAL DEFECTS IN RESIDENT ALIENS

In report of surveys of groups of individuals here and there as well as of insane institutions, references are frequently made to the preponderance of mental defect and insanity among aliens as compared with those of native parentage. In the case of insanity this would not be surprising considering their economic status and the stresses incident to transplantation in a new environment. In case of mental defect it should not be so. In determining the matter, however, the dullard must not be confounded with the mental defective, and in most community surveys this error undoubtedly prevails to a greater or less degree. As indicating the proportion of mental defect and insanity among the native and foreign born, the following figures are of interest.

Among drafted men of the Army from New York, 1,293, or 9.24 per thousand, were found defective. Roughly, 33 per cent of these were born in New York, 32 per cent in foreign countries, and 35 per cent in other States. New York has the largest foreign-born population of any State. Unfortunately the nativity of men in the draft was not made a matter of record. Compared with certain other regions, this rate is low.

In the case of drafted men from the Appalachian Mountain region, representing purely American parentage, mental defect was extremely high, reaching 27.2 per thousand.

In community surveys the figures differ, but usually the feeble-minded rate is said to be about 10 per thousand. In a survey of school children of Porter County, Indiana, 1,087 girls and 1,098 boys were examined. Of the total number, 9 per thousand were mentally defective. These were practically all native-born children. In a similar survey in the State of Arkansas, 13,725 children were examined and 6.7 per thousand were found defective. All these were native born.

In 1910 there were 187,791 inmates in insane hospitals of the United States, with 54,096, or 28.8 per cent, foreign-born white. In New York State in 1918 there were 38,311 insane in institutions, of whom 10,064, or 26.9 per cent, were aliens. According to the United States census for 1910, over 29 per cent of the population of the State were foreign-born. These figures would seem to indicate a preponderance of insanity, but none of mental defect among the foreign-born in New York at least, as

compared with the native-born. The amount of illiteracy throughout the country was very much greater, being 12.7 per cent among the foreign-born as compared with 3 per cent of native-born white.

Fortunately the liability of aliens to become insane after arrival is recognized in law, and provision is made for their deportation if they do become insane, within a period of five years. Although physical disability may give rise to dependency, it is only a temporary burden, but insanity and mental defect cause perpetual and increasing burdens to society.

MENTAL DEFECT AMONG ARRIVING ALIENS

It is this fact that renders important the detection of mental defect among arriving aliens. With the specific mention of imbecility, feeble-mindedness and constitutional psychopathic inferiority in the law as excludable, new impetus was given to the detection of all psychopathic states among this class.

With the advent of the war, however, there was a marked falling off of immigration, and consequent arrival of mentally defective persons. Following the Armistice, the flow of aliens again increased, but in the meantime a law barring illiterates had been enacted. This in itself is a potent factor in reducing the number of mental defects that may arrive.

During the past seven years the average rate per thousand certified on account of mental defects has been slightly more than three times the rate per thousand confined in institutions for feeble-minded in the State of New York. This is a better measure of the rate of efficiency of inspection of arriving aliens than comparison of the number certified with the estimated number of feeble-minded at large as determined by community survey. The legal action taken in the former circumstances is attended with dire results to the individuals affected, whereas in surveys a particular classification for statistical purposes has no adverse effect on the individual personally. On account of this medico-legal aspect the greatest care is necessary in the certification of mental defect among aliens.

The tests employed to detect mental defect embody two definite principles: one, the determination of the amount of acquired knowledge, and the other, the determination of native mental ability. Both methods have their uses in practice. As the result of experiment and long usage, these tests have been standardized and forms for the individuals of each race have been established.

On account of the diversity of races and languages, the examinations must relate to individuals rather than to groups. Attempts have been made to apply the Alpha and Beta tests adopted by the Army, but as yet they have not been found to be adaptable to the conditions to be met.

The arriving aliens from a given ship represent numerous races and comprise individuals of all ages. Many who can pass the literacy test have difficulty in using a pencil and the majority of them can be made to understand the mental tests only after lengthy individual explanation. The present methods of testing which have been in use for years and improved from time to time, comprise short personal interviews followed by definite performance tests when indicated. Any alien showing the slightest deviation from normal is required to undergo the secondary test. A diagnosis is not based on performance tests alone, but on studies of the reaction of the alien during repeated examinations. In fact, the detection of mental defect among aliens comprises a distinct specialty, wherein the rights of both the individual and the Government must be kept constantly in mind.

In comparing the results of mental examinations of arriving aliens with those of drafted men, the percentage of incidence among the latter is very much higher: 12 per thousand as compared with 1.6 per thousand. This is believed to be due to fewer defects among immigrants, for the reason that they are a group self-selected to conform to well known legal restrictions. Furthermore, every alien so certified must be a definitely proven case, and by reason of his self-interests every alien renders as thorough cooperation in the examination as possible. Finally, mental defect does not occur with equal frequency at all age levels, and border-line cases are never certified.

While among drafted men 12.06 per thousand were rated as mentally defective, only 4.5 per thousand were actually discharged from military service on this account. It would seem, therefore, that border-line cases had been included, a class which, as stated, it would be impracticable to certify under the immigration law.

The ancestors of the mental defects of today undoubtedly had their origin abroad. What percentage of this taint was imported and what acquired through inbreeding and other causes after arrival, it is impossible to say.

Notwithstanding the more thorough methods now employed for their detection, cases may, from time to time, slip through. On account of the inherent difficulties this could not be otherwise. While individual cases may be held temporarily (ten days to two weeks) they cannot be observed indefinitely nor in their normal environments, and in the interest of individual justice border-line cases must be released.

In the Army a period of three months was utilized within which to detect 64 per cent of the mental defect, and the maximum of observation was three years. For the detection of mental defect, new methods must be developed and better means provided for applying those already

known. As in the case of insanity, a probational residence of five years should be established by law, during which aliens would be held under observation and deported if found defective.

Eventually, the methods of detecting mental defect should be made so rapid of application that they would be used on all and in reality be the measure for admission rather than any literacy requirement. While the dullard may not be excluded under present law, it should be amended so as to prevent his embarkation abroad.

In the meantime mental defect should be thoroughly studied in relation to social and other causative conditions. The results obtained would be useful relative to our resident population, and might throw additional light on the right of different alien types to enter the country. As a part of these studies, all future applicants for admission to the military services should be specially examined and records kept as to their social and racial status. By such means the country will be better served and our knowledge of pathologic mentality advanced.

The Military Surgeon

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Original articles, items of news and matter of interest to the Services are welcomed. Requests or reprints should be made at the time of forwarding articles.

EDITOR,
COLONEL JAMES ROBB CHURCH
Medical Corps, U. S. Army

EDITORIALS

ORIENTATION AS IT APPLIES TO THE MEDICAL STUDENT AND THE PRACTITIONER

The betterment of conditions relative to the practice of medicine in the United States has occupied the attention of thoughtful men for some time past, not only in reference to members of the profession but taking into consideration also the interest of the general public. As a resultant from this, we have the classification of medical schools, the raising of the standards not only of the course of instruction in them, but also of the preliminary requirements for enrollment; the establishment of the National Board of Examiners and state legislation tending to aid in these matters and also to eradicate the practice of quackery and charlatanism and the suppression of the exploitation of nostrums.

It is indisputable that much has been accomplished to do away with lax measures and faulty standards. With the passage of laws and statutes which forbid the indiscriminate prescribing of alcohol and narcotics a very substantial prop has been knocked from beneath those who posed as healers of disease merely in order to forward their own financial interests. Conditions are far and away better than they were in the happy-go-lucky days when a course of reading in the office of a certified physician and an examination at the completion of it gave a young man the legal right to minister to those who needed professional care.

Granting this happy hypothesis, it is not difficult to conceive that there are further steps which might be taken to the advantage of the profession itself as well as to the public to which it owes its livelihood. Just how far measures of this sort may be put into operation without the stigma of paternalism is difficult to predicate. It is incontestable that as our civilization in this Western continent grows older, as we lose some of the rawness of recent establishment, there will be a sedimentation of much that is undesirable and the clear and desirable element will outbalance that which was a general contamination.

That we, a comparatively young nation, are not unique in being confronted with this condition, is evident from the opinions expressed by Dr. Paul LeGendre in a recent lecture delivered before the French Academy of Medicine.¹ The practice of medicine in France is bound down by many more conventions than are current with us, and still Dr. LeGendre thinks that he sees means for the betterment of conditions in his own country.

He admits, quite frankly, in this lecture that his views may be utopian, but suggests that they do lead in the right direction, and states that in his long career as a teacher he has endeavored to carry them out so far as was practicable.

He starts with the hypothesis that while there may be some men plowing who ought to be practicing medicine, there are, without doubt, many practicing who should be plowing. We all admit that readily. It is an unfortunate condition which cannot be remedied by law except by state interference with the rights of the individual.

He suggests, however, that it might not be altogether impossible for the family physician, "omnipraticien" to quote the word he invents, to guide the youngster whom he has known from infancy in the choice of a profession. In this he would be aided by his knowledge of his own mental, moral and physical attainments as well as by the heredity influences which shadow his life. In the medical schools and hospitals he sees a further opportunity for the instructors. He would have them not merely fine machines to impart so much technical knowledge to whoever might apply for it, but personal counsellors who should endeavor to guide into appropriate channels the efforts of those who sit with them in the lecture hall or walk the hospitals under their guidance. He pleads for a closer training in regard to the responsibilities of those who wish to make medicine a life work. Not alone as to jurisprudence and matters of strict law, but also in the lesser niceties of relations with their patients and their colleagues. He pleads for

¹De l'orientation professionnelle. Rôles respectifs des maîtres, des Associations et des Pouvoirs publics. — Paul LeGendre, *Bul. Acad. de Méd.*, No. 16, 19 April, 1921

that which is coming to be recognized as an essential in any form of education, a *personal* relation with, and in addition to, that of imparting certain special knowledge.

His last plea is for a "*regional orientation*," something which he admits may be just now quite chimeric. In this, he would have a medical census kept by regions, showing the number of general practitioners in each, the number of various specialists, proportion as to population and other data enabling a doctor to form some idea as to available sites for an advantageous location. He cites the difficulty encountered now by the man who wishes to change location and who has no better guide than the invitation of some eager Chamber of Commerce, a statement in the local press or a letter from a friend.

As a matter of fact, there is in the United States a trend towards what Dr. LeGendre advocates. Certain of our larger schools have recognized the advantage which the *preceptorial* method of medical education carried for the student and its potentialities of good for the public on which he was to practice. Therefore, in addition to routine curricular work some of the more important schools have made it their business to see that those under instruction are advised as to their particular capabilities prior to graduation, *e. g.*, Public Health work, editorial duty or any of the specialties. There seems to be a growing belief that the teaching of medicine may be made too much of a science when it arrives at the point where pure doctrine excludes almost entirely the personal element which is so necessary in the relations between patient and practitioner. It is not implied that the advance of the scientific side of the profession is in any way a detriment, but that it should not exclude the humanities which have always existed between the family physician and his close personal friend who often looks to him for mental as well as bodily health.

Just prior to our entry into the late war the Council of National Defense and the American Medical Association did a helpful work for the state in the classification as to qualification of many of the medical profession, and by an initial sorting, so to speak, saved much valuable time and possibly the placing of a number of square pegs in round holes.

While Dr. LeGendre intimates that he may be ahead of his time in the theory which he advances, is it not true that it may be considered after all as a reversion to earlier methods of instruction, a plea for the superiority of the hand-made product as against the many exact duplicates turned out by machine?

JAMES ROBB CHURCH.

IS EVOLUTION AN UNMIXED BLESSING?

"A Little Nonsense Now and Then"

At a protracted session of the Executive Council, during the recent meeting in Boston, we had an interesting conversation along this subject with one of the leading endocrinologists of Milwaukee, and suggested that he put his views into written speech that we might publish them. He was entirely noncommittal in response, but the discussion stimulated us to thought with the result that we are not at all sure that there may not be cogent arguments on the negative side of the question, especially if we approach it from the standpoint of the medical man.

We make no doubt but what we, the ultimate product described by Darwin, in his "Descent of Man" have much to boast of over our remote and hypothetic simian ancestors. Our opponable thumbs, our developed frontal prominences, and only partially hirsute bodies we have turned very largely to our own advantage. Still, there lingers in our mind the unallayed suspicion that we might, with all these modern improvements, perhaps have kept at least some of the physical attributes of the anthropoid ape, the *macacus rhesi*, the canine species, or even of the more humble dipterous insect of the *muscidae* family, with advantage.

It is a homely axiom that we cannot have our cake and eat it too, and therefore we must balance the increase of our cerebral convolutions against the loss of other useful but homely attributes of less exalted forms of life. Nevertheless, it *would* have been an advantage if with our superior cerebration we might have clung to some of the highly developed specialties which we discarded in some dim Pliocene or Devonian era.

What painstaking surgeon has not recognized that those of his cult should, by right and justice, have been endowed with three hands instead of the inadequate two which stingy nature furnished them? 'Two clean hands and one nice, convenient dirty one! My, my, what an advantage it would give one over his mere bimanual neighbor. Now, suppose that when we followed Mr. Darwin's chain of descent, we had gained our added intellectuality, but that those of us who were fore-ordained and predestined to practice this calling of surgery, had been spared the serviceable, long, prehensile tail and those useful feet which had so much in common with the upper members. How comfortable this practical caudal appendage would have been when with both hands enveloped in rigidly sterile gloves we wished to adjust our eyeglasses, to shoo away a particularly inquisitive fly, or scratch the place which never seems to itch save when both hands are absolutely useless to allay the irritation. The operating gown could be readily adapted for its exit and it would cause no annoyance, unless perhaps some hurried or

careless nurse stepped on it. Then again, what a commanding position the worried operator would have in a difficult operation if he could suspend himself by it from a stout iron bar directly above the table and be in intimate relation to all the structures of his laparotomy which now he has to crane himself into an obtuse triangle to see. With his useful and non-sterile foot he could direct the flashlight exactly where he wished and not be dependent on the whim of some stupid but well intentioned assistant who persisted in illuminating the ascending colon when all interest was focussed on the sigmoid flexure. Of course, it is a matter of conjecture, but we are pretty well convinced that such adjuncts would raise his surgical batting average well above .375.

And again, with those capable and intelligent feet he might give his own anaesthetic, thus being altruistic in saving his patient a fee, or egoistic in adding one to his own charges. There are no end of possibilities to it and in our mind's eye we can even see surgeons doing two operations at once—or even *four*, if they were ambidextrous with both hands and feet and had acquired that curious detachment which allows the organist to play in four different directions at once. Just suggestions these; dreams of possibilities which might have eventuated if we had not "evolted" quite so radically.

Suppose, after his four-hand-and-a-tail operation the surgeon could come into his surgical ward with a Pointer dog nose, and halting instantly on the threshold say to the ward nurse, "Miss Dimity, there is pus in No. 17, down there in the corner at the other end of the room," and as he advanced, sniffing slightly with his educated olfactories, "Yes, pure staphylococcus albus, and it is in that third stitch on the left hand side."

How much unnecessary redressing it would obviate, how much time it would save. Then, again, if he were endowed with the compound eye of the *musca domestica*, think of his strategic superiority. A little of one or both eyes on his operation, a bit on the anesthetist, a fragment on the sterilizer and a disapproving remainder on the house surgeon light heartedly flirting with the operating room nurse behind his back.

We might go on and find solace in the thought of the comfort which a good comfortable pachyderman exterior would be to absorb the vicious attacks of some keen and sarcastic cross-questioning lawyer—in fact long stretches of opportunity extend before, or behind, us as the fascinations of the subject unroll themselves before our mental vision. Alas, however, it is all utopian and we must content ourselves with our physical uprightness, our increased convolutions and depend on the ingenuity which goes with them to make up for the loss of these former natural advantages.

ASSOCIATION NOTES

PROCEEDINGS OF THE TWENTY-NINTH ANNUAL MEETING OF THE ASSOCIATION OF MILITARY SURGEONS OF THE UNITED STATES, BOSTON, MASS., JUNE 2-4, 1921, HOTEL COPLEY-PLAZA.

MINUTES OF MEETING

The Twenty-ninth Annual Meeting of The Association of Military Surgeons of the United States convened at Boston, Mass., June 2, with Surgeon J. W. Kerr, U.S.P.H.S., in the chair.

The order of procedure was as follows:

June 2

Opening Meeting, 9:30 A.M.

1. Reports of: Executive Council, Secretary-Treasurer, Committee on Arrangements, Literary Committee, Committee on Legislation, Boards of Award, Necrology Committee.
2. Appointment of: Nominating Committee, Auditing Committee, Committee on Resolutions.
3. Consideration of Amendments to Constitution and By-Laws.
4. Miscellaneous Business.
5. Address of the President.
6. Addresses: The Flight Surgeon—A Method of Securing Physical Efficiency, Maj. William F. Bonner, M.R.C., U.S.A.; After Care and Medical Followup of the War Risk Insurance Beneficiary, Past Asst. Surg. J. G. Townsend, U.S.P.H.S.

Second Session, 2:00 P.M.

1. Addresses: The Occurrence of Mycotic Infections Among Arriving Aliens in Relation to National Preparedness, Past Asst. Surg. T. B. H. Anderson, U.S.P.H.S.; Work of the United States Public Health Service in Relation to Discharged Ex-Service Men, Surg. Gen. Hugh S. Cumming, U.S.P.H.S.; American Relief Work in Serbia, Maj. Edgar E. Hume, M.C., U.S.A.

Third Session, 8:00 P.M.

1. Addresses: Medical Aspects of Naval Aviation illustrated, Lieut. J. F. Neuberger, M.C., U.S.N.; Syphilis, Lieut. Comdr. C. S. Stephenson, M.C., U.S.N.; Remarks on the Neurology of Syphilis, Lieut. Comdr. R. Sheehan, M.C., U.S.N.

*June 3**Fourth Session, 9.30 A.M.*

1. Addresses: Medical Administration of the Intermediate Section, A.E.F., Lieut. Col. E. L. Ruffner, M.C., U.S.A.; Mental Examinations of Aliens and Their Bearing on the Potential Military Strength of the Nation, Past. Asst. Surg. H. V. Wildman, Jr., U.S.P.H.S.; Some Lessons of the World War in Medicine and Surgery from the German Viewpoint, Comdr. William Seaman Bainbridge, M.C., U.S.N.R.F.

Fifth Session, 2.00 P.M.

1. Addresses: The Surgical Treatment of Empyema by a Closed Method, Maj. Arvine E. Mozingo, M.R.C., U.S.A.; Dispersion of Bullet Energy in Relation to Wound Effects, Col. Louis B. Wilson, M.R.C., U.S.A.; Lesions of the Knee in Ex-Soldiers, Maj. Frederic J. Cotton, M.C., U.S.A.

Sixth Session, 8.00 P.M.

1. Addresses: The Responsibility of the Medical Corps in the Proper Physical Development of the Men of the Army, Col. J. E. Goldthwait M.C., U.S.A.; The Recent Prevalence of Influenza and Its Preventive Inoculation in the Japanese Navy, Surg. Comdr. Yasuzaemon Hori, Imperial Japanese Navy.

*June 4**Seventh Session, 9.30 A.M.*

1. Report of Nominating Committee.
 2. Election of Officers.
 3. Address: Observations in Italy, Capt. Frank L. Pleadwell, M.C., U.S.N.
 4. Installation of Officers and Reports of Committees.
 5. Unfinished Business.
- Adjournment.

The meeting was called to order by the President. The following reports were then read by the Secretary-Treasurer:

REPORT OF THE EXECUTIVE COUNCIL

During the period April 22, 1920, to June 1, 1921, there were ten meetings of the Executive Council, as follows:

1920—

- July 14th—meeting called by mail.
- Sept. 1st—meeting called by mail.
- Oct. 1st—meeting called by mail.
- Nov. 1st—meeting called by mail.
- Dec. 1st—meeting called by mail.

1921—

Jan. 3d—meeting called by mail.

Feb. 21st— meeting at Army and Navy Club, Washington, D. C.

April 1st—meeting called by mail.

May 3d—meeting called by mail.

June 1st—meeting at Copley-Plaza Hotel, Boston, Mass.

At the meetings of the Council held February 21 and June 1, a number of names were proposed for honorary membership in The Association, and upon recommendation of the Council these names will be presented to The Association in annual meeting for election.

At the meeting of February 21, an amendment to the by-laws, increasing the subscription price of the journal to members of The Association from \$3 to \$3.50 per year was presented to the Council, which amendment was endorsed by the Council and ordered presented to the Annual Meeting for adoption.

REPORT OF SECRETARY-TREASURER

To the president and members of the Association of Military Surgeons:

I submit herewith a report of the activities of the office of Secretary-Treasurer for the period from April 16, 1920, to June 1, 1921. During the period covered by this report we have gone forward slightly in membership; the figures in regard to the resignations and new members are as follows:

New Members, April 16, 1920 to June 1, 1921	682
Resignations, same period	450
Increase	232

Every effort has been put forth in the office, looking to an increase in our circulation. From the lists supplied by the various services covering their reserves, we have sent out several thousand letters and folders, outlining the aims and purposes of our Association, and inviting these men to join. While the results from these letters have been not as large as might have been hoped, they were sufficient to make the work of benefit to The Association. It is the purpose to advance the membership in The Association so far as is possible to do so from the Secretary's office, but it is believed that if those who make up The Association would take into consideration the fact that the personal element plays a large part in setting forth the advantages of membership, the increase would be much more rapid than if left to the results to be obtained from form letters sent from the Secretary's office.

The following is a statement of the financial affairs of The Association for the period covered by this report:

RECEIPTS

Admission Fees	\$3,221. 10
Annual Dues	14,080. 65
Subscriptions	2,541. 82
Advertising	8,164. 18
Miscellaneous (including sale reprints, insignia and loan)	5,958. 17
Total Receipts	\$33,965. 92
Cash Balance, April 16, 1920	2,223. 52
Grand Total	\$36,189. 44

DISBURSEMENTS

Printing Journal	\$22,046. 03
Salaries	5,682. 40
Cost of Reprints	1,514. 24
Expenses of Meetings	438. 15
Dishonored Checks	37. 50
Postage	1,278. 60
Telephone	84. 41
Stationery and Printing	1,136. 39
Miscellaneous (including cost of insignia, carfare, certificates of membership, etc.)	1,233. 65
Total	\$34,051. 37
Withdrawn from National Bank of Washington and deposited on interest Union Trust Co.	1,000. 00
Balance National Bank of Washington, May 16, 1921	1,138. 07
Grand Total	\$36,189. 44

ASSETS, MAY 16, 1921

U. S. Bonds, Third Liberty 4½%, Converted	\$15,000. 00
U. S. Bonds, Fourth Liberty 4½%	4,000. 00
U. S. Bonds, Victory Loan 4¾%	6,000. 00
Balance on Deposit Union Trust Company	1,282. 91
Balance on Deposit National Bank of Washington	1,138. 07
Total	\$27,420. 98
Less Debt	2,500. 00
Total	\$24,920. 98

UNION TRUST COMPANY ACCOUNT

Balance on Hand April 15, 1920	\$ 573. 10
Interest credited Dec., 1919, not accounted for in April 1, 1920, audit	2 85
Interest June, 1920	3 84
Deposit September 27, 1920 (Wellcome Prize money)	500 00
Interest December, 1920	2 82
Deposit March 1, 1921	1,000. 00
Total	\$2,082 91

DISBURSED

May 1, 1920, Check No. 1	\$300. 00	
May 1, 1920, Check No. 2	200. 00	
April 7, 1921, Check No. 1a	300. 00	800. 00
Balance on deposit May 16, 1921	\$ 1,282 91	
On hand National Bank of Washington, May 16, 1921	\$ 1,138. 07	
Received May 16-31, 1921	591. 15	
	\$ 1,729 52	
Disbursed May 16-31, 1921	333 83	
Leaving a balance on hand, June 1, 1921, of	\$ 1,395 69	

REPORT OF CHAIRMAN ON SUBORDINATE ASSOCIATIONS

It is with deep regret that external circumstances beyond my control prevent me from submitting this report in person.

A preliminary report having been published in the last issue of THE MILITARY SURGEON, only one thing needs to be added, namely, that the Association of Military Surgeons of Illinois held, in addition to several monthly meetings in Chicago, its first annual meeting in Springfield, Ill., May 16 last. At that meeting several good papers were presented and discussed. In addition to the scientific value of the assembly, it must be added that the good fellowship developed between the members from different parts of the State promises a larger membership for the near future, since the spirit developed guarantees a well-placed propaganda.

In spite of repeated efforts I have been unable to arouse enough enthusiasm in other States to see the establishment of similar associations; but the time has been too limited for that, as under the present conditions, due to the usual reaction following every large war, it requires many personal efforts to arouse an interest in anything pertaining to the military, and, apparently, I have not succeeded in finding men willing to go to that much trouble.

It seems to me that even with one example the plan to create state

associations should not be abandoned, but rather continued with renewed energy, and a definite plan adopted for that purpose.

Rules should be prescribed which shall definitely establish the relationship between subordinate and the national body, and the committee discharged and state committees appointed, as many in the East and West may feel that Chicago is altogether too dominant in the medical world. The time has arrived for the profession to be aroused from its patriotic lethargy, and I am sure we have many members who can do it in their own spheres.

Respectfully submitted,

GUSTAVUS M. BLECH.

There were no reports from the Committee on Arrangements, Literary Committee, Committee on Legislation, nor the Necrology Committee. The Chairman announced the findings of the Board of Award for the Wellcome Prize Competition, the first prize going to Lieut. Col. L. C. Duncan, M.C., U. S. Army, and Honorable Mention to Lieut. Col. Gustavus M. Blech, M.C., National Guard, Illinois.

The following amendment to the by-laws was then read and passed:

"Resolved, That Section 4, of Article IV, which reads as follows: 'The Annual subscription to the official journal by members of The Association shall be three dollars (\$3.00), payable in advance, and the journal shall be stopped on expiration of unrenewed subscription,' be amended by substituting words and figures three dollars and a half instead of three dollars."

Under miscellaneous business the following list of Honorary Members was presented as recommended by the Executive Council and elected to membership:

Colonel C. A. Peters, D.S.O., Canadian Medical Service.

Dr. Gaston Louis Ernest Bergasse, Inspector General, M.C., French Army.

Surgeon Comdr. Y. Hori, I. J. Navy.

Surgeon General S. H. Chuan, Chinese Army.

Lieut. Col. Leoncio I. de Mora, Peruvian Army Medical Corps.

Lieut. Comdr. Joaquin Sanchez Gomez, M.C., Royal Spanish Navy.

Lieut. Emilio Garcia Valdes, M.C., Cuban Navy.

The President then appointed the Auditing Committee, Lieut. Comdr. R. Sheehan, M.C., U.S.N., and Asst. Surg. Gen. J. C. Perry, U.S.P.H.S.; and a Nominating Committee, Capt. F. E. McCullough, M.C., U.S.N., and P.A. Surg. J. G. Townsend, U.S.P.H.S. There was no Committee on Resolutions appointed.

The President then delivered his address (which appears elsewhere

in this issue), after which the following addresses were delivered. The Flight Surgeon—A Method of Securing Physical Efficiency, Maj. William F. Bonner, M.R.C., U.S.A.; After Care and Medical Followup of the War Risk Insurance Beneficiary, Past Asst. Surg. J. G. Townsend, U.S.P.H.S.

The meeting then adjourned until 2.00 p.m.

The second, third, fourth and fifth sessions were carried out as per program.

At the sixth session, the following gentlemen, who were elected to honorary membership at the first session of the meeting, were called before The Association by the Secretary, who addressed them as follows and invested them with the badge of The Association in token of their election to membership:

Colonel E. M. Pilcher, C.B., C.B.E., M.B., D.S.O., F.R.C.S., K.H.S., Consulting Surgeon to the British Army—what a very galaxy of the alphabet this is which follows your name. And how very much achievement and patient labor it represents. Before presenting you with the badge of The Association, I hope I may be pardoned for making a personal statement quite aside from my character as Secretary. In the early part of 1917, while on duty in France, my work carried me into the British front lines, and while there it was my bad fortune to be stricken with an attack of pneumonia. I was a perfect stranger to those with whom I found myself, with no identification other than the "white pass" which was my license for circulation in the British area. I was placed in a British Hospital and there treated, not as a casual stranger with a "white pass," but with all the very fine skill and courtesy and kindly care which one would receive from his own people. For two weeks while I struggled with a diseased lung, your Corps, both commissioned and enlisted, were unremitting in their efforts to do everything to make me comfortable and further me on my way to recovery. I was not even allowed to thank you for it, for with your British characteristic you regarded it as a matter of course and something which was entirely natural. I have never forgotten it and have never ceased to be grateful for those good Samaritans who took a sick stranger in and made him feel at home. You, sir, are the first officer of the British Medical Service to whom it has been my pleasure to present the badge of our Association. Do you wonder that, aside from official gratification in the presentation, there should be a very warm personal one?

Col. C. A. Peters, D.S.O., Canadian Medical Service, an officer who knows what is the stress of service with warring forces, who carries in the letters after his name his country's recognition of his distinguished service in the defense of the Empire, so near a neighbor of ours that the

maple leaf might belong to either of us, it is with much pleasure and all respect that I now formally add your name to the list of those Canadians who already stand as Honorary Members on our rolls, and in testimony thereof present you with the badge of our Association.

Surgeon Commander Yasuzaemon Hori, Imperial Japanese Navy, representing a nation which by brilliant achievement through Noguchi and many others has done much to advance scientific medicine, it is with much pleasure that I announce to you your election as an Honorary Member of The Association of Military Surgeons of the United States, and in testimony thereof present you with its insignum.

Teniente Comandante, Joaquin Sanchez y Gomez, de la marina de España, oficial distinguido en el servicio de su patria y bien conocido en su especialidad, nosotros damos a Vd. la bien venida como miembro honorario de nuestra asociacion, y me hace mucho placer de presentar a Vd. esta medailla, testimonio de nuestra apreciacion de vuestros distinguidos servicios.

Doctor Emilio Garcia y Valdez, Medico de segunda de la marina de la Republica de Cuba, nosotros nos felicitamos de recibir á Vd. como miembro honorario de nuestra Sociedad y me gusto mucho de presentar a Vd. esta medailla en testimonio de vuestra elejcion.

The following papers were then presented, after which the meeting adjourned to 9.30 a.m., June 4: The Responsibility of the Medical Corps in the Proper Physical Development of the Men of the Army, Col. J. E. Goldthwait, M.C., U.S.A.; The Recent Prevalence of Influenza and Its Preventive Inoculation in the Japanese Navy, Surg. Comdr. Yasuzaemon Hori, Imperial Japanese Navy.

FINAL SESSION

The seventh session met June 4, at 9.30 a.m., and the Nominating Committee submitted the following list of nominations:

For President: Capt. Frank L. Pleadwell, M.C., U.S.N.

For First Vice-President: Col. Charles Lynch, M.C., U.S.A.

For Second Vice-President: Lt. Col. David S. Fairchild, M.C., N.G., Iowa.

For Third Vice-President: Asst. Surg. General J. C. Perry, U.S.P.H.S.

For Secretary-Treasurer: Col. James Robb Church, M.C., U.S.A.

These names were placed before the Association and elected to office. The officers were then installed, and Captain Pleadwell upon taking the chair delivered the following address:

Gentlemen of the Association:

I deeply appreciate the distinction that you have conferred upon me by electing me to the Presidency of the Association. I have been a

member of the Association for twenty-one years, and while this is but a brief period when compared with the length of time some of you have been connected with the organization, still I feel that it has been sufficient to give me something of an understanding of the sentiments and traditions of the Association, and an appreciation of its purpose, as set forth in the Constitution.

If I interpret aright the traditions of this Association, I know that your selection of a President is determined by considerations that transcend mere personal relations, and that you have been animated by a desire to do honor to that branch of the Service to which I belong.

In assuming this office I am not unmindful of the distinguished group of officers who have preceded me, and when I contemplate the prospect of following in their footsteps, and of emulating them in maintaining the growth and vigor of the Association, I cannot but feel a deep sense of humility, tempered, however, with the firm resolve to make my administration conform to the high standards set by my predecessors, and accelerate, as far as possible, the momentum it has already achieved.

The report of the Auditing Committee was then received, and it was found that the accounts, as submitted from the audit made by Captain Riggs and Lieutenant Colonel Fairchild, were correct and just.

MISCELLANEOUS BUSINESS

Under unfinished business the Association moved a vote of thanks to Col. S. J. Mixter for his very generous offer of hospitality to members of The Association during the Boston meeting and directed the Secretary to draw up this resolution and transmit a copy of it to Colonel Mixter.

An address was then read by Lieut. Comdr. Joaquin Sanchez Gomez, M.C., Royal Spanish Navy, after which the meeting adjourned subject to the call of the President.

At a meeting of the Executive Council of The Association of Military Surgeons, July 11, 1921, the following names were proposed and elected to membership in the Association:

Medical Corps, U. S. Army

Captain

John W. McKeever

First Lieutenant

Arthur Wheeler Drew

Medical Reserve Corps, U. S. Army

Lieutenant Colonel

Edward L. Roloff

Majors

Nathan M. Benyas

John F. Bresnahan

Dudley Earl Mackey

William D. McFee

Denn Orton Thompson

Captains

Edwin Glen Condit

Wendell Cotton

Julius H. Hurst

Francis Livingston Montgomery

Edwin A. Murbach

Dorsy McNeelas Ryan

Charles Leroy Williams

First Lieutenants

Joseph John Knepper

Gordon Albert Little

John Breckenridge Overall

Andrew Victor Stephenson

Medical Corps, U. S. Navy

Commander

George S. Hathaway

Lieutenant

Richard Covert Satterlee

Medical Corps, U. S. N. R. F.

Lieutenant Commander

O. W. Holecomb

Lieutenant

William Christian Becker

United States Public Health Service

Surgeon

William H. Baldwin

Passed Assistant Surgeons

Leslie Bane Crumrine

Fauntleroy Flinn

Assistant Surgeon

Maximilian Kern

Acting Assistant Surgeon

Samuel Brown Norris

National Guard

Orlando W. Pickard

Capt. M.C. Michigan, N.G.

Lucius A. Salisbury

Lieut. Colonel M.C. New York, N.G.

Erasmus H. Kleman

Major M.C., Maryland N.G.

Otto B. Wunschow

Major M.C. Tennessee N.G.

Associate Member

William Watkins Bryans

1st Lieut. Med. Adm. Corps, U. S. Army



COMMENT AND CRITICISM

GENERAL POLICIES AND REGULATIONS FOR THE ORGANIZED RESERVES¹

1. *Components of the Army of the United States.*—The military policy provided for by Congress contemplates the organization of our military forces into one harmonious, well-balanced, and effective Army, the Army of the United States, consisting of the Regular Army, the National Guard when in the service of the United States, and Organized Reserves, including the Officers' Reserve Corps and the Enlisted Reserve Corps.

2. *Missions of the three components.*—The missions of these three components may be stated as follows:

a. The Regular Army—

(1) To provide adequate garrisons in peace and in war for our oversea possessions.

(2) To provide adequate peace garrisons for the coast defenses within the continental limits of the United States.

(3) To provide personnel for the development and training of the National Guard and the Organized Reserves.

(4) To provide the necessary personnel for the overhead of the Army of the United States, wherein the duties are of a continuing nature.

(5) To provide an adequate, organized, balanced, and effective expeditionary force, which will be available for emergencies, within the continental limits of the United States or elsewhere, and which will serve as a model for the organization, discipline, and training of the National Guard and the Organized Reserves.

(6) The Regular Army is the first component of the Army of the United States in peace and in war.

b. The National Guard—

(1) In time of peace, to provide an adequate, organized, and effective force, which will be available in minor emergencies for employment within the limits of the United States, by the States or by the United States.

(2) In time of war or major emergencies, when Congress has authorized the use of troops in excess of those of the Regular Army, to provide an adequate, balanced, and effective component of the Army of the United States for employment by the United States without restrictions.

¹Extracted from Special Regulations No. 46, War Department, February 16, 1921

(3) The National Guard is the second component of the Army of the United States in peace and in war.

c. *The Organized Reserves*—

(1) To provide a trained, organized, and balanced force which may be readily expanded and developed into an adequate war component of the Army of the United States to meet any major emergency requiring the use of troops in excess of those of the Regular Army and the National Guard.

(2) The Organized Reserves are the third component of the Army of the United States.

(3) The Regular Army and the National Guard may be employed separately or together in minor and in major emergencies, but the Organized Reserves constitute purely a war force and can be employed only in the event of a national emergency declared by Congress.

3. *Development of the components*.—A clear understanding of the missions of these components and a spirit of mutual support and cooperation between them is essential to the development of one harmonious Army. A well-defined mission for each component having been definitely established, no reason exists for the interference of one with another or for the development of one component to conflict with or retard the progress of either of the others. It is the policy of the War Department to develop the Regular Army and the National Guard to the full strength provided by law and for the present to maintain the tactical units of the Organized Reserves as cadres only, with complete officer personnel and with the enlisted personnel including only those non-commissioned officers and specialists necessary to make the organization capable of rapidly assimilating the numbers of men required to bring them to war strength.

4. *Basic peace organization*.—The basic peace organization of the Army of the United States provides for all of the essential elements for a complete and immediate mobilization for the national defense in the event of a national emergency declared by Congress. (See sec. 3, National Defense Act, as amended by the act of June 4, 1920.) The first echelon will be composed of the Regular Army, the National Guard, and the Organized Reserves. The strength of the initial, or first echelon, is prescribed by the War Department, taking into account the war plan considered.

5. *Tactical organization*.—The Army of the United States shall be organized so far as practicable into brigades, divisions, and army corps; and, whenever the President may deem it expedient, into armies. (See sec. 3, National Defense Act, as amended by the act of June 4,

1920.) Tables of Organization prescribe in detail the organization at peace and at war strength of field armies, army corps, divisions, and subordinate units thereof, and of the auxiliary and special troops. Basic tables of organization applicable to the Organized Reserves are the same as those adopted for the Regular Army (war strength).

6. *Territorial organization*.—The principal territorial command within the continental limits of the United States is the corps area, and in the oversea possessions, the department. The primary functions of the corps area are the organization, training, and mobilization of troops. The present system of corps areas is based upon the military population available, and normally each corps area is capable of developing an approximately equal number of troops.

7. *Allotments to departments and corps areas*.—As a general rule each corps area will contain one or more army corps, with certain auxiliary and special troops, composed of troops of the Regular Army, the National Guard, and the Organized Reserves. The allotment of quotas to departments and to corps areas is the function of the War Department. The quota in the Organized Reserves normally allotted to each corps area will include three Infantry divisions and a proper proportion of corps, army (including Cavalry), auxiliary, and special troops. This normal quota will be varied to accommodate differences in the number and character of population between the several corps areas and in the strength of the other two components of the Army.

8. *Localization of units*.—Allocation to the States, Territories, and the District of Columbia of units of the Organized Reserves within departments and corps areas will be made by department and corps area commanders in accordance with a general distribution approved by the War Department. Based on the military population, each corps area should be subdivided into division areas. As a general rule the subdivision of division areas is not necessary or desirable except where they comprise more than one State, Territory, or the District of Columbia. The location of units entirely comprised within the limits of any State, Territory, or the District of Columbia will be determined by a board, a majority of which shall be reserve officers. (See sec. 3a, National Defense Act, as amended by act of June 4, 1920.) So far as practicable, each administrative unit will be organized within the limits of a single State, Territory, or the District of Columbia. The law above referred to also provides that the names, numbers, and designations of divisions and subordinate units thereof that served in the World War between April 6, 1917, and November 11, 1918, shall be preserved as such as far as practicable. Designation of units will be made by department and corps area commanders from the names

and numbers placed at their disposal by the War Department, in accordance with the complete plans of allocation, except in the case of units entirely comprised within the limits of any State, Territory, or the District of Columbia, when the designations shall be determined by the local boards composed as provided above.

9. *General war plans.*—Under the provisions of section 5, National Defense Act, as amended by the act of June 4, 1920, the War Department General Staff is charged with the preparation of plans for the national defense and for the use of the military forces for that purpose, both separately and in conjunction with the naval forces, and for the mobilization of the manhood of the Nation and its material resources. General war plans involve defensive and offensive measures and usually cover the mobilization, concentration, and initial deployment of the troops for a given situation and contain a statement of the mission of each force. The detailed plans for the operations contemplated are prepared by the commanders of the forces and become effective after concentration is completed.

a. The mobilization of the Organized Reserves is effected within each department or corps area by the department or corps area commanders in accordance with the mobilization program prescribed by the War Department.

b. The concentration of our forces in probable theaters of operations is provided for in plans which are developed in detail by the War Department.

c. The employment of our forces after concentration in the execution of assigned missions is provided for in plans which are developed by the commanders of the forces.

10. *Mobilization plans.*—In every war plan covering a situation calling for troops in excess of those of the Regular Army and the National Guard, and involving the employment of the Organized Reserves, the mobilization plan is essentially the same. The basic plan for the peace organization of the Army of the United States provides for all military organizations necessary to make possible an immediate and effective mobilization. In such mobilization the departments and corps areas have the primary function of organizing, equipping, and training troops. The employment in war of the troops generated in any department or corps area will be governed by the war plan covering the situation, and the theaters of operations will rarely, if ever, coincide with the departments or corps areas.

The mobilization of the Organized Reserves includes—

a. The assembly of the Organized Reserves component at two or more mobilization camps.

- b.* The recruitment of the Organized Reserves component to war strength, by voluntary enlistments or through the draft.
- c.* Supply and equipment of the Organized Reserves component.
- d.* Training of the Organized Reserves component.

PART II

REGULATIONS FOR THE ORGANIZED RESERVES

SECTION I.—COMPOSITION AND ORGANIZATION

11. *Officer personnel.*—Except as provided by paragraph 13, herein the officer personnel of the Organized Reserves is furnished by the Officers' Reserve Corps. (See sec. 37, National Defense Act, as amended by the act of June 4, 1920.) The appointment, assignment, transfer, promotion, and discharge of Reserve officers will be governed by appropriate regulations pertaining thereto.

12. *Enlisted personnel.*—Except as provided by paragraph 14 herein, the enlisted personnel is furnished by the Enlisted Reserve Corps. (See sec. 55, National Defense Act, as amended by the act of June 4, 1920.) Enlistments, assignments, transfers, promotions, and discharges in the Enlisted Reserve Corps will be governed by appropriate regulations pertaining thereto. The general requirements for enlistment are eligibility for enlistment in the Regular Army, and military or technical training. The military or technical training required will be such that the man upon joining his unit will be able to function in his capacity therein without further basic training. Details as to eligibility are contained in the regulations for the Enlisted Reserve Corps.

13. *Regular Army personnel.*—Selected commissioned and enlisted personnel of the Regular Army will be allotted to each department and corps area by the War Department for assignment to the Organized Reserves, where they will perform those duties that are of a continuing nature and which, therefore, can not be performed by the reserve personnel. The numbers and grades of such officers and enlisted men will be announced from time to time by the War Department.

When the Regular Army personnel assigned to a department or corps area is inadequate to perform the duties indicated herein, the department or corps area commander will request the Adjutant General of the Army to place on active duty such reserve officers and enlisted men, who have consented to accept such active duty, as may be required to supply the deficiencies.

14. *Peace strength.*—Units of the Organized Reserves shall be organized in accordance with the approved Tables of Organization

for the Army of the United States on a war-strength basis. They shall be complete as to officer personnel so far as possible. For the present the enlisted strength will not exceed that necessary to provide the essential numbers and grades of noncommissioned officers and specialists. The enlisted strength authorized for organizations or the Organized Reserves will be prescribed from time to time by the War Department.

15. *Assignment of officers.*—Reserve officers will be assigned or attached for training in peace and for duty in case of emergency to —

- a. The Regular Army,
- b. The National Guard,
- c. The Organized Reserves,
- d. To special duties and activities exclusively controlled by the War Department or by branches thereof.

These regulations deal primarily with reserve officers comprised in class c.

All reserve officers included in *d* will be notified by the War Department, or proper branch thereof, of their special assignment. All other reserve officers will be made available to the commander of the department or corps area in which they reside, for assignment. Department or corps area commanders will assign or attach, so far as practicable, reserve officers to units in the vicinity of their places of residence *and in accordance with their qualifications and preferences*. Only such officers as would in a major emergency be required to fill the quota of such units will be assigned to Regular Army units. Only such reserve officers as are members of the National Guard will be assigned to the National Guard. Others will be assigned or attached to units of the Organized Reserves. In order to assist department and corps area commanders in making suitable assignments, such commanders will be furnished with extracts from the personal and classification records of each reserve officer, or such other record as may be available. Department and corps area commanders will keep the detailed personal and classification records of each reserve officer made available to them for assignment. Suitable rosters of reserve officers will be published from time to time, giving their assignments and addresses. When a reserve officer changes his place of residence he will, if practicable, be transferred to a unit in the vicinity of his new residence. If his new residence is within the same department or corps area, such transfer will be made by the department or corps area commander. If his new place of residence is in another department or corps area, his former department or corps area commander will cancel his assignment and forward his record to the department or corps area commander having jurisdiction over the officer's new place of residence and the

officer will be assigned within the department or corps area in which he then resides.

Organization of the Organized Reserves will be initiated by the assignment of available officer personnel to units. When the necessary complement of reserve officers in a department or corps area is not complete, the commander thereof will obtain the required number, if possible, either by inducing qualified persons to apply for commissions or by the development of reserve officers with the means at his disposal.

16. *General principles.*—The administration of the Organized Reserves will conform to that prescribed for the Regular Army so far as practicable. When organizations have been sufficiently developed to function as such, department and corps area commanders should require commanding officers of organizations to perform their normal administrative duties so far as may be practicable. Until sufficiently developed for such purpose the administrative functions of organizations will devolve upon the next higher commander or may be delegated to and be performed by such officers as department or corps area commanders may direct.

17. *Duties of department and corps area commanders.*—Department and corps area commanders are charged with all military activities within their respective territorial areas except those specifically reserved to the War Department. Their general duties are defined in Army Regulations and War Department orders.

Department and corps area commanders are particularly charged with the organization, development, training, and administration of all units of the Organized Reserves allotted to their areas.

18. *Duties of Army corps commanders.*—Army corps commanders shall command the organizations to which they are assigned. Under the supervision of department and corps area commanders they are charged with the organization, development, administration, training, and tactical efficiency of their commands.

19. *Duties of division and subordinate commanders.*—The commanders of divisions and subordinate units of the Organized Reserves shall command the organizations to which they are assigned. They are charged with the organization, development, administration, training, and tactical efficiency of their commands. Under direction of higher commanders and within the territorial areas assigned to their organizations for recruiting purposes, they shall endeavor to bring the commissioned personnel of their organizations to required strength by inducing qualified persons to make application for commissions in the Officers' Reserve Corps, and shall recruit the required

enlisted strength. They shall maintain at their respective headquarters all the prescribed plans for mobilization, rosters, and records, and shall furnish such rosters and reports as may be required.

20. *Duties of Regular Army personnel.*—Because of the limited time that reserve officers not on active duty can be expected to devote to this work, the successful development of the Organized Reserves is largely dependent upon the efforts of the officers of the Regular Army assigned to organizations. Entire cooperation in the carrying out of approved policies and training plans must exist between such officers and the reserve officers of the organizations. In organizations commanded by reserve officers most of the duties of administration and training, the care of and accounting for Government property, and the maintenance of records will devolve upon officers of the Regular Army assigned thereto while the commanding officers thereof are on an inactive status. An officer of the Regular Army assigned to an organization will perform the duties of executive officer therein.

21. *Records.*—The records to be kept at the headquarters of each unit of the Organized Reserves will be substantially the same as those used for corresponding units of the Regular Army. Individual records of reserve officers and members of the Enlisted Reserve Corps will be kept as prescribed in regulations pertaining thereto. Any change in status of a member of the Organized Reserves shall be noted on his record and prompt report thereof made through channels.

22. *Annual 15-day training period.*—Within the limits imposed by law and subject to the availability of funds and to the requirements of War Department orders and instructions on the subject.

23. *Transmission of mobilization warning.*—In the event of a national emergency declared by Congress, the President may direct the mobilization of the Organized Reserves in whole or in part and may thereafter retain all or any part thereof in active service for such period as he may deem the condition demands. The proclamation announcing such mobilization will be published in newspapers, by notices posted in public places, and otherwise made known. The orders directing mobilization in accordance with the President's proclamation will be transmitted by the Adjutant General of the Army through the usual military channels or other agencies. Department and corps area commanders may request United States marshals, postmasters, census enumerators, and other United States officials and bureaus to notify all the members of the Organized Reserves that mobilization has been authorized; and when their organization had been called into active service, to notify them of this fact also.

24. *Responsibility.*—Department and corps area commanders are

charged with the mobilization of all organizations of the Organized Reserves within their respective areas and of all reserve officers and enlisted men residing therein not specifically exempted from their control by the War Department. Commanding officers of organizations of the Organized Reserves are charged with the mobilization of all reserve officers and enlisted men assigned or attached to their commands, in accordance with existing regulations and approved mobilization plans.

25. *Company rendezvous.*—The commanding officer of every company, troop, battery, or detachment of the Organized Reserves as soon as practicable after the organization of his unit, with approval of the next higher commander, will designate a place of assembly of his command in the event of mobilization, which will be known as the company rendezvous.

Commanding officers of divisions, brigades, regiments, and smaller organizations will also designate rendezvous points for their staffs and for officers and men of their commands not belonging to companies or corresponding units.

26. *Reporting for duty.*—A mobilization warning having been issued as contemplated in paragraph 23 authorizing the mobilization of a portion or all of the Organized Reserves, the War Department will then direct the mobilization thereof in such numbers and in such an order of priority as will meet the requirements of the situation. Upon receipt of the order directing the mobilization of his organization and directing him to report at the rendezvous on a specified date, or upon learning that such an order has actually been issued, every member of the Organized Reserves affected by such orders shall report at his rendezvous on the date specified. In event that his order is received or that he learns that mobilization has been directed when he is at a place distant from his rendezvous, he may report in person to the commanding officer of the nearest unit of the Organized Reserves, at the same time reporting this fact by telegraph to his commanding officer. It will be the duty of the officer to whom he reports in person to verify his military status and, in case the member so reporting is an officer, to furnish him with transportation to his rendezvous or such other point as his commanding officer may direct; in case such member is an enlisted reservist, he will be furnished transportation and subsistence to his rendezvous or such other point as his commanding officer may direct. All such travel will be by the shortest usually traveled route.

From the time that he is required by orders that have been received by him to obey the same, or from the time that he learns by proper

notice that the mobilization of his organization has been directed, every member of the Organized Reserves will be subject to the laws and regulations for the government of the Army of the United States, and will use his utmost endeavor to report for duty; for willful failure or neglect to comply with said laws and regulations or to report for duty, he will be subject to trial and punishment.

27. *Subsistence and quarters at rendezvous points.*—Organized Reserve units will assemble at the unit rendezvous at a fixed hour and day and proceed to mobilization camps by first available transportation. In exceptional cases only, when some unexpected delay is encountered, it may be necessary for the unit commander to make arrangements to provide food and sleeping quarters for their men while at the rendezvous points. In such cases the unit commander will obtain emergency bids in writing for such service in hotels, restaurants, and other similar places and accept the most favorable offer. The cost of this per diem subsistence will not exceed three times the money value of the ration. The settlement of accounts therefor may be made directly by finance officers of the United States Army, or through the medium of agent officers.

28. *Records.*—Administrative records are prepared in accordance with regulations and instructions of the War Department.

29. *Preliminary physical examination.*—On assembly of units at company rendezvous, company commanders shall cause a physical examination to be made of their personnel, both officers and enlisted men, for the purpose of discovering the presence of any infectious or contagious diseases, such as smallpox, typhoid fever, measles, mumps, and venereal disease. Any men with infectious or contagious disease, excepting venereal disease, and those who for any reason are unable to travel, will return to their homes until recovered sufficiently to join their organizations. Such men will be reported by the organization commander to the department or corps area commander, who will issue the necessary instructions to enable them upon recovery to join their proper stations or be otherwise disposed of.

Men with venereal disease who are able to travel will accompany their units and will be reported to the medical authorities immediately on arrival at the mobilization camp. This examination will be made by a medical officer of the Regular Army or of the Reserve Corps on active duty, if available; if not, by a civilian physician employed for this purpose.

31. *Movement from company rendezvous.*—As soon as a company or detachment is assembled at its rendezvous the senior officer present shall notify his immediate superior and the department or corps area

commander by telegraph, and proceed to the destination indicated in his orders.

The movement of units from rendezvous points to mobilization camps will be made under the direction of department and corps area commanders, who will provide for their transportation in the most practical manner and for rationing en route. When department and corps area commanders deem it advisable, regiments and corresponding organizations may be assembled prior to movement to mobilization camps.

31. *Mobilization camps.*—The assignment of the Organized Reserves to mobilization camps will be made by department and corps area commanders in accordance with instructions on the subject issued by the War Department.

The plan of mobilization in each department or corps area will cover the supply and equipment of the organizations of the Organized Reserves in their areas.

Commanders of units of the Organized Reserves will be informed through channels as to the source from which this equipment will be supplied.

When the war reserve of supplies is sufficient to allow equipment of the reserves allotted to a department or corps area, that equipment may be stored at or in the vicinity of the mobilization point or segregated at the nearest general reserve or intermediate depot. The quantity of equipment and supplies, both initial and for maintenance, for the Organized Reserves which may be on hand, is determined by congressional appropriations made for that purpose.

Department and corps area commanders will designate the priority of the units of the Organized Reserves in the supply of initial equipment when the amounts available for their command are less than requirements for the units ready for outfitting.



BOOK REVIEWS

SURGERY, ITS PRINCIPLES AND PRACTICE. Ashhurst, Len and Febige, Phila-
delphia and New York

In the new edition of this well-known and excellent textbook the author by rewriting and bringing it up to date has added greatly to its value, as a textbook for the student and a reference book for the practitioner. It is not an exhaustive treatise on surgery as it is impossible to incorporate the entire subject of surgery in one volume, and it is not the intention of the writer to do so, but excellent judgment is shown in the selection of what to teach the student and in the clear and logical way in which it is presented, furnishing a foundation upon which the knowledge of surgery is to be built. The book is divided into 29 chapters, as was the last edition; these have been largely rewritten, adding sixty pages to the book besides seven new colored plates and one hundred new cuts. It is profusely illustrated with excellent selections, largely from the author's collection of cases.

In many parts of the book the influence upon the development of surgery, and the author's experience in France during the recent World War is manifest. Chapter seven, "Gunshot Wounds," is a new chapter on military surgery prefaced with a diagram of battlefield and evacuation of the wounded in the A. E. F. The Dakin-Carrel method, debridement, and other methods of treatment of wounds as developed in this war, as well as gunshot wounds of special structures and regions are given in detail and well illustrated. The subject of reconstructive surgery, including plastic surgery and skin grafting has been rewritten and added to. The subjects rewritten or appearing for the first time in this edition, not already noted, include transfusion, local anesthesia, burns and scalds, mustard gas and acid burns, trench feet, therapeutic uses of radium, emphysematous gangrene, chronic fibrocystic ostitis, empyema, and many others.

All the commoner operations are described, giving the technique clearly step by step and often with illustrations of the instruments to be used. Obsolete methods have not been included, so we have the full twelve hundred pages devoted to live subjects.

WALTER D. WEBB.

SURGERY—A Text Book by Various Authors. Edited by George E. Gask and Harold W. Wilson. Published by J. and A. Churchill, London.

Seventeen members of the surgical staff of St. Bartholomew's Hospital have written this large text book on the principles and practice of surgery. It is divided into twenty-eight sections, each section being assigned to a specialist on the staff of the hospital. It is profusely and well illustrated, largely from original cases in the service of the hospital and from specimens in the St. Bartholomew's Hospital Museum, with thirty-nine full page plates, in addition to the many cuts, many of which are in colors.

Being written entirely by members of the staff of a single large hospital, there has been a very close cooperation which has resulted in an avoidance of contradictory statements, superfluous repetitions and a divergence of views in the different sections, which so often renders a text book by many authors unsuitable for the student. Although the authors have not attempted to incorporate the entire subject of surgery in one volume, it is larger than most text books and the print is finer than is customary in most American medical books, so it more nearly approaches a system

of surgery and is a valuable book for the practitioner who does not possess in his library a number of books on the various surgical specialties.

As with all works written by many authors, some sections are better than others. Section XIV, on surgery of the face, mouth, and jaws, and Section XXVI, on surgery of the urinary and male genital systems, are especially well illustrated and commendable.

W. D. WEBB.

SURGERY, Its Principles and Practice. By various authors. Edited by William Williams Keen, M.D., LL.D., Emeritus Professor of the Principles of Surgery and of Clinical Surgery, Jefferson Medical College, Philadelphia. Volumes VII and VIII, two octavos totalling 1,800 pages, with 996 illustrations, 29 in colors; also a separate Index Volume to the entire eight volumes of Keen's Surgery. W. B. Saunders Company, Philadelphia. Price \$25.00.

In a review in *THE MILITARY SURGEON* of a small book on "The Treatment of War Wounds," written by Doctor Keen and published in 1918, the writer had this to say: "Dr. Keen has been gracious enough to compile for the information of American surgeons what, in his judgment, has to date proven most valuable and worth while in the treatment of war wounds. . . . It is to be hoped that he may find time in the near future to add to his 'Keen's Surgery' the remarkable advances which the opportunities of the war have afforded in increasing our knowledge of the practice of surgery." In this we have not been disappointed, as evidenced in two new volumes of Keen's Surgery, Volumes VII and VIII, with a comprehensive Index Volume to the entire eight volumes. That Doctor Keen has been able to gather together a great amount of new knowledge, both of military and naval surgery, and to add to our general knowledge through the application of the principles developed on the basis of advances in War Surgery, is chiefly evidenced in Volume VII. In Volume VIII will be found more of a blending of military and civil surgery besides some excellent chapters in which are discussed subjects generally regarded as belonging to civil practice alone. It must be borne in mind, however, that the military surgeon in times of peace is frequently located where he has to be a more or less universal specialist, an "all around man"; hence he must have as a reference library the latest and best authorities to aid and counsel him in his work. Such a source of up-to-date information is to be found in Keen's Surgery brought up to date. The civil surgeon, a potential military surgeon, has in these volumes a source of information from which he can inform himself as to the professional knowledge that may be expected of a first-class naval or army surgeon; he also has the same source to teach him many of the advances in civil practice. The contributors (sixty-eight in number) to the volumes are, in many instances, the same men who so worthily wrote the chapters in the preceding six volumes. The new contributors are of the same standing and altogether they are representative of the most learned and experienced men of the day. Doctor Keen is to be congratulated upon his selection of contributors. Volume VII opens with a few short articles, several supplementary to those on similar topics in earlier volumes. The first one hundred pages contain short but satisfactory articles bringing our knowledge up-to-date, upon Inflammation; Diseases caused by animals, insects, and reptiles; Anthrax; Surgery of the Skin, Syphilis; Gas gangrene—this latter a particularly informative chapter by Sir Cuthbert Wallace; Tetanus—this excellent chapter by Dr. Fred T. Murphy is summed up in a *résumé* which to the writer's mind tells the true story of Tetanus up until the present time.

The next one hundred and thirty-six pages are devoted to two articles of about

equal length upon the medical departments of the army and navy in war, and are chiefly guides to be followed in war practices as we know them to-day; they are evidently intended more for the trained professional men of the services. There are many instructive chapters following those mentioned—among them one by Cannon on traumatic shock; another, "Transfusion of Blood and Its Substitutes," by Burton J. Lee. If this chapter is mastered there should be no hesitancy upon the part of any physician in successfully carrying out some one of the good methods of transfusion (or its substitutes) described.

There is a chapter upon surgical technique by John H. Gibbon which may be referred to with confidence as it tells very well how to treat wounds, based upon the experiences of the late war. Truesdale's tourniquet is described and recommended as "offering many advantages over the older methods of constriction." There are chapters on fractures; gun-shot fractures; gun-shot wounds and severe injuries to the nervous system; injuries of the peripheral nerves; military surgery of the joints; orthopedic surgery in civil life; military orthopedic surgery. The volume is concluded by an exhaustive article on military surgery of the vascular system by that master of the subject of the surgery of the arteries, Rudolph Matas.

Volume VIII also opens with several short chapters supplementary to others in previous volumes. These chapters are intended chiefly to bring our knowledge of the subject of goitre up to date. There is an excellently illustrated chapter on the surgery of the hypophysis by A. W. Adson, in which the author describes his technic in doing a hypophysectomy by the intra-dural approach; this technic was suggested to him by Heuer who first did two of these operations successfully by this method. This chapter is chiefly an elaboration of a previous article by the author published in the *Journal of the American Medical Association* and in the "Collected Papers of the Mayo Clinic" in 1918. Wm. J. Taylor writes a supplementary chapter on amputations, in which he describes well and illustrates the probable sites of amputations from the artificial limb standpoint. He also describes fully the so-called guillotine amputations, and from the records of the hospital where there was an admission of 119 patients in whom flapless operations had been performed, 66 per cent required re-amputation. There are excellent chapters on operations on bones and joints, and surgery of the head. Chas. H. Frazier contributes two chapters on surgery of the fifth (trigeminal) nerve, and surgery of the gasserian ganglion. It is to be noted that Doctor Frazier uses the scalpel in the division of the sensory root; it would appear that this technic is not quite so safe for others as is the use of the delicate guillotine instrument used by Adson for the same purpose. There is a splendid chapter by Richard S. Harte and Walter E. Lee on war wounds of the face and jaws. They tell how the early treatment of these terrible injuries should be carried out, how the soft tissues may be reconstructed and the terrible deformities of the mouth, lips, and cheeks overcome, or at least made less conspicuous. There is a good chapter on dental surgery and treatment of fractures of the jaws, from which the general surgeon can learn much. Doctor Chevalier A. Jackson writes a chapter on direct laryngoscopy, bronchoscopy and esophagoscopy, in which his well-known instruments are illustrated and described, as well as his technic of procedure. From among the number of hundreds of foreign bodies which Doctor Jackson has removed from the air passages he illustrates some twenty-six different kinds—truly a remarkable collection as proving the real value of Doctor Jackson's teachings. One of the most exhaustive and best chapter in the book is that upon surgery of the thorax by Dr. Geo. H. Heuer. Doctor Crile, in a chapter upon Surgery of the abdomen and pelvis, repeats his well-known views upon shock and anesthesia.

John B. Deaver and D. B. Pfeiffer contribute a supplementary chapter upon appendicitis, as do W. J. Mayo and D. C. Balfour one upon surgery of the gall-bladder and biliary ducts. There is a short chapter by Richard M. Pearce and J. Harold Austin on tests of renal functional efficiency in surgical conditions. This chapter can be referred to with confidence. There is a short supplementary chapter on surgery of the kidney, by the late Doctor Joseph Ransohoff whose expressed opinions were always characterized by the highest type of surgical judgment. Two chapters, one on surgery of the bladder and ureter by Dr. Bransford Lewis and another on surgery of the prostate by Hugh H. Young, classed in the text as supplementary, are in reality rather exhaustive—particularly that by Young. However, much of this latter chapter has appeared elsewhere in the rather frequent writings of this distinguished surgeon. Among the remaining chapters, all of which are of high quality, may be mentioned one by R. Tait McKenzie, "The Place of Physiotherapy in Surgical Treatment." Too little is known about this important subject, as well as upon the subject of the chapter on diagnostic immunologic reactions and specific therapy in surgical disease, written by Dr. John A. Kolmer. The bed-side and operating-room relationship between the laboratory man and the practicing physician or surgeon is too remote. A chapter on poison gas in warfare, by James Robb Church, contains the best material of anything that the writer can recall having seen. Gas attacks are illustrated and described as well as the agents employed and their effects. There are two remarkable illustrations—one of the *blue type* of asphyxia from phosgene poisoning with intense venous congestion, and one of the *pallid type* of asphyxia from phosgene poisoning with circulatory failure. Colonel Church describes and tabulates experimental work upon dogs to determine the value of bleeding early, or of delayed infusion; the proper time for bleeding and infusion as indicated by haemoglobin determination. It appears that the object of treatment is to relieve edema and congestion of the lungs. Certain gas inhalations tend to produce a marked concentration of the blood, hence the value of bleeding and the infusion into the circulation. Mustard gas burns are illustrated in their earlier and later stages and the indicated treatment given. Protective measures against gas, both in the line of respiratory and wearing apparel, are described.

The volume closes very properly by a well-illustrated note by Doctor W. W. Keen himself, on a simple, cheap, well-made and effective method of dressing an inguinal anus which has stood the test of twenty-seven years of successful use.

JOHN E. SUMMERS, M.D.

A PHYSICIAN'S ANTHOLOGY OF ENGLISH AND AMERICAN POETRY. Selected and arranged by Casey A. Wood, M.D., and Fielding H. Garrison, M.D. Oxford University Press, London and New York, 1920. Dedicated to the memory of Sir William Osler.

In this "gathering of the flowers" it is pleasant to be reminded that the mind of the medical practitioner is not bound by the locus of technical knowledge to confine exclusively within the circumference swept by the radius of strictly scientific teaching. I think the putting out of this little volume is a contradiction of what Colonel Garrison says in his Foreword, "The physician's calling makes him a realist." I doubt that. I have always doubted it when I have heard the same theory advanced. True, the doctor in his vocation is faced by much that is very material, and as the trend of the profession is more and more towards the precise lines of exact science, he may, not *must*, to some extent, be shut away from the realm of romance. But, after all is said, any calling which is based on the mysteries of life and death, whose fabric is so interwoven with human hope and fear and kindness and intimate friend-

ship, cannot claim an existence based solely on materialism. In "McAndrew's Hymn" Kipling points out that romance is not at all confined to extra-material conditions. He finds it there in the pulse of the ship; in the heart of the engine room. As a matter of fact, I doubt if any of us, even the most cynical scoffers, are at heart pure materialists. I certainly hope not.

Colonel Garrison's foreword is delightful reading, very full of interesting knowledge and, as are all his writings, expressed in thoughtful, purposeful English.

The anthology is carefully made and the included poems cover what is best in many decades. In order that the authors may not be accused of attempting to "spoon feed" the public with poetry of their own choice, it should be mentioned that this collection was submitted to Sir William Osler and that he edited it himself, deleting some of the poems which were originally included and adding others which had been omitted. As is stated, it is not a book of verse *by* physicians, but a book of verse *for* physicians. It covers the human emotions in their many phases and is not confined to any particular set. It deals incidentally with the poetry of the World's War, but not to the exclusion of that of former wars, and it does not specialize on passion as a human characteristic. In the matter of what is selected from the writings of the poets of the last war, I am sorry that John McCrae's "Flanders Fields" is omitted. Of course it is perfectly true that the vehicle of expression in this, the rondeau, is an unnatural and rather discredited one, but the fact remains that these verses attained a very marked popularity with the general public, and it seems that there might be a concession on this ground under the general rule of *Vox populi, vox Dei*.

The volume is attractive in appearance and holds, in convenient form, many of the old favorites brought into close association, as well as some poems which are not equally well known. It is a satisfactory little book to own and a gracious tribute to a great master.

JAMES ROBB CHURCH.

BOOKS RECEIVED

Books received are acknowledged in this department and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interest of our readers and as space permits.

- A MANUAL OF SURGERY**, by Francis T. Stewart, M.D. Fifth Edition with 599 illustrations. Philadelphia: P. Blakiston's Son & Co., 1921. Price \$10.00 net.
- GYNECOLOGY**, by Brooke M. Anspach, M.D. 520 illustrations. Philadelphia and London: J. B. Lippincott Company. Price \$9.00.
- SURGICAL CLINICS OF NORTH AMERICA**. Vol. 1, No. 1, issued serially, one volume every other month. Octavo of 259 pages, with 112 illustrations. Per Clinic Year (February to December); paper \$12.00 net; cloth \$16.00 net. Philadelphia and London: W. B. Saunders Company.
- CHIRURGIE DE GUERRE ET D'APRES-GUERRE**, by Auguste Broca. Masson et cie, Editeurs. 120 Boulevard Saint-Germain, Paris. 1921.
- MICROBIOLOGY**. Edited by Charles E. Marshall. Third Edition, Revised and Enlarged; with 200 illustrations. Philadelphia: P. Blakiston's Son & Co., 1921. Price \$4.00.
- TRAUMATIC SURGERY**, by John J. Moorhead, M.D., F.A.C.S. Second edition. Octavo of 564 pages, with 619 illustrations. Philadelphia and London: W. B. Saunders Company, 1921. Cloth \$9.00 net.
- SURGERY OF THE UPPER ABDOMEN**, by John B. Deaver, M.C., Sc.D., LL.D., F.A.C.S. and Astley Paston Cooper Ashhurst, A.B., M.D., F.A.C.S. Second Edition, with 9 colored plates and 198 other illustrations. Philadelphia: P. Blakiston's Son & Company. Price \$14.00 net.
- HUMAN HEREDITY**, by Casper L. Redfield. Chicago: Heredity Publishing Company, 1921.
- OPERATIVE SURGERY**, by John J. McGrath, M.D., F.A.C.S. Sixth Edition, Revised, with 369 illustrations, including full-page color and half-tone. Philadelphia: F. A. Davis Company, 1921. Price \$8.00 net.
- MANUAL OF OPERATIVE SURGERY**, by John Fairbairn Binnie, A.M., C.M., F.A.C.S. Eighth Edition, Revised and Enlarged; with 1628 illustrations. Philadelphia: P. Blakiston's Son & Company. Price \$12.00 net.
- THE SURGICAL CLINICS OF NORTH AMERICA**. April, 1921, Vol. 1, No. 2. W. B. Saunders Company, Philadelphia.
- THE ALLEN TREATMENT OF DIABETES**, with progressive diet lists. Fourth Edition, by Lewis W. Hill, M.D., and Rena S. Eckman. Boston: W. M. Leonard. Price \$1.75 net.
- INFECTIONS OF THE HAND**, by Allen B. Kanavel, M.D. Fourth Edition, thoroughly revised. Illustrated with 185 engravings. Philadelphia and New York: Lea & Febiger. Price \$5.50.
- NUTRITION AND CLINICAL DIETETICS**, by Herbert S. Carter, M.A., M.D., Paul E. Howe, M.A. Ph.D., and Howard H. Mason, A.B., M.D. Second Edition, thoroughly revised. Philadelphia and New York: Lea & Febiger, 1921. Price \$7.50.
- DISEASES OF THE SKIN**, by Oliver S. Ormsby, M.D. Second edition, thoroughly revised. Illustrated with 445 engravings and four plates in colors and monochrome. Philadelphia and New York: Lea & Febiger, 1921. Price \$10.00.
- MOUTH HYGIENE**, by Alfred C. Fones, D.D.S. Second Edition, thoroughly revised. With 218 illustrations and eight plates. Philadelphia and New York: Lea & Febiger, 1921. Price \$5.00.

Obituary

Those of our membership whose deaths have been noted since our last report are as follows:

1st Lt. Charles A. Allen, M.R.C., U. S. Army.

Maj. Chester C. Beckley, M.R.C., U. S. Army.

Maj. Thomas P. Camelon, M.R.C., U. S. Army.

Capt. George F. Cott, M.R.C., U. S. Army.

Capt. J. C. Graffin, M.R.C., U. S. Army.

1st Lt. H. B. Hess, M.R.C., U. S. Army.

Surg. Capt. Ernest Courtney Lomas, C.B., D.S.O., M.B., F.R.C.S., Honorary Member.

Dr. S. J. Meltzer.

Lt. Col. J. M. Moss, M.C., U. S. Army.

Dr. J. B. Roc.

Dr. John Swancott, Jr.

Capt. Morris H. Tindall, M.C., U. S. Army.

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DISPERSION OF BULLET ENERGY IN RELATION TO WOUND EFFECTS¹

BY COL. LOUIS B. WILSON
Medical Reserve Corps, U. S. Army

(With Seven Illustrations)

THE bizarre effects of missiles on tissues are very puzzling. The surgeon sometimes sees a great, jagged, torn wound of entrance made by a shell fragment which has penetrated only a short distance in the tissues yet causing injury at only an imperceptible distance from those parts actually touched in its course. On the other hand, he may see a wound caused by a small shell fragment or a grenade splinter, the point of entrance of which is so minute as to be almost imperceptible, and yet which interiorly has pulped tissue at a distance of more than 1 cm. from those portions actually touched in passage. Usually such shell or grenade fragments, deformed bullets or other irregular missiles not only vary so much in their shape but also in their velocities, neither of which can be accurately known beforehand, that it is practically impossible to discover by their study the laws by which their energy has been dispersed or to predicate the type and extent of tissue injury which may result therefrom. We must therefore confine our studies of principles to missiles of regular form and of at least approximately known velocities.

The chief interest centers around missiles of high velocity. Comparatively speaking, it is not the push of the elephant's shoulder with which we are concerned, but rather the kick of the mule. Though the former may be the more ponderable force, the latter creates the more disastrous results. Our experience with high velocity missiles is almost all within the last fifty years. The spears and arrows of savage peoples and of European armies of the middle ages produced their fatal effects most frequently by hemorrhage since their velocities and their total energies were small and delivered through cutting edges. The projectiles of early firearms were planned from empirical experience gained

¹Read before the Association of Military Surgeons, Boston, June 3, 1921.

in throwing stones from catapults and blunt-pointed bolts from cross-bows. They were relatively heavy missiles of relatively low velocities and depended more on surface shock than penetration for their fatal effects. For more than a hundred years after the invention of the rifled gun barrel, large spherical lead bullets were propelled through it at very low velocities. The only gain from rifling was increased accuracy which lasted so long as the interior of the rifle barrel was clean and fairly free from eroded lead. It was not until there was developed in the American colonies sometime about 1725, a simple means for keeping the rifle barrel clean, preventing leading and checking the escape of gas at the bottoms of the rifle grooves that it became feasible to put enough powder behind a relatively small missile to propel it with sufficient velocity to give fatal wounds in large animals. This simple but effective device was the greased patch which was made, usually, of thin cotton cloth, buckskin or pig's bladder, and used behind a bullet of slightly less diameter than the caliber of the rifle. At this one stroke the colonial backwoodsman worked a revolution in firearms. He dispensed with the heavy iron ramrod and mallet previously necessary for driving home the oversized lead bullet. He swept the residue of powder out of the future track of the bullet every time he loaded his gun. He absolutely prevented leading of the barrel. He made a perfect gas check, thus permitting the use of all the energy of his explosive. He made it possible to use charges of powder of a size hitherto undreamed of. He increased velocities from about 500 f.s. to 1,600 or even 2,000 f.s. He thus flattened the trajectory of his missile so that errors of aim were minimized. He rotated his undeformed spherical bullet with great regularity, thus insuring high accuracy. According to a well-known law of physics, when he increased the velocity three times he increased the striking energy nine times with bullets of the same mass. This high velocity missile from the backwoods sharpshooter's rifle, though used by relatively few men, was a very potent factor in the winning of the colonials' war for independence. Unfortunately, records of wound production by it are largely a matter of tradition. In the hands of a few careful shots it continued to be a great tamer of the wilderness until our Civil War brought out as never before the importance of increased speed of fire, resulting in the development of the metallic cartridge. But black powder metallic cartridges did not readily permit the use of patched bullets. Thus, the powder residues eroded and the lead again fouled the barrels to such an extent that heavy charges with small calibers and resulting high velocities were not possible.

With the substitution in cartridges, first of paper patches around lead bullets, a system still used by Switzerland, and later with the dis-

covery of smokeless powder, the introduction of nickel, low-carbon steel or bronze jacketed bullets, the rifle tube could again be kept free of lead and of powder residue. Calibers could be reduced and velocities again increased to about 2000 f.s. This was the approximate muzzle velocity of the missiles from the Mauser and Krag rifles of the South African and Spanish-American wars.

The earliest experiments in this important field were developed to practical use about 1870, and in 1875 Kocher, of Berne, then a young man, published the first series of experiments on wound injuries from high velocity projectiles. It should be noted, however, that the velocities with which Kocher experimented, from 1,800 to 2,000 f.s., while a very great increase over those of previous European and American cartridge type of military weapons whose velocities were from 1,200 to 1,400 f.s., were little if any greater than those velocities of missiles from the backwoodsman's rifle of the Revolutionary War period. I have, however, found no experiments other than incidental observations, chiefly concerning the effects on game, of the missiles of the Revolutionary War period. I think, therefore, that Kocher may properly be credited as the pioneer in accurate observations on wound effects of high velocity bullets. Following Kocher, several German, Austrian, French, and Roumanian observers conducted more or less extensive experiments on the effects of small caliber high velocity projectiles. In England most accurate observations were made by Sir Victor Horsley about 1895. In this country, Colonel Louis A. Lagarde was one of the earliest, most careful, and most thorough of experimentalists. Woodruff and Beyer have also conducted most careful and valuable experiments in this country on the ballistics of wound production.

Most of the observations of the experimenters already mentioned were conducted on bodies of men and animals. Some firing was done into cans containing water, wet clay, sand, marbles, etc. Much of the early attention was given to effects on bone. Of the work of the early experimentalists, that of Sir Victor Horsley and of Woodruff was most concerned with the problem from the standpoint of physics. Horsley attempted to discover the laws of dispersion of energy by firing directly into masses of clay and studying later in the dried mass the track of the missile and the disturbance of the mass in immediate relation thereto.

These studies, though made on missiles with relatively much lower velocities than those of military rifles of today, namely, approximately 2,000 f.s., while those of today are from 2,500 to 3,000 f.s., are very germane to our study of the effects of the most modern missiles since at long ranges the highest velocity missile falls to velocities of those of the

older type. It must be constantly borne in mind, however, that the so-called "explosive effects" so rarely seen during the Spanish-American War were produced by missiles of the 2,000 f.s. type only at relatively short ranges and were therefore of much rarer occurrence than during the present war. It is the possible explanation of some of these puzzling explosive effects to which I wish to direct attention.

In 1914, 1915, and 1916 the medical and popular press of the various warring European nations conducted a most violent controversy, those of each country charging their enemies with the use of dumdum or explosive bullets. As everyone now knows, very few purposely deformable, and fewer still truly explosive, bullets were used by any of the European nations. The British, more properly to balance their bullet and make it conform more accurately in its ballistic coefficient to their tracer and armor-piercing bullets, did substitute for the forward end of the lead core a mass, first, of aluminum and later of hardened wood fiber, but these, in both instances, were covered with cupro nickel jackets with high tensile strength and did not deform more rapidly than the standard bullet of all-lead core. Occasionally hunting bullets with soft lead points were probably used in military weapons by individual soldiers on both sides. I have seen a few cartridges of German, Austrian, and French models loaded with these bullets. I have one odd-size American cartridge loaded with an expanding soft nose bullet recovered during the Chateau-Thierry advance of July, 1918. It, however, was taken from the body of a German sharpshooter who was using a German rifle adapted to the American cartridge which had been sent to Germany for experimental purposes in considerable quantities about 1912. A careful search of salvage dumps, both before and after the armistice, in both eastern and western France, resulted in the finding of thousands of cartridges loaded with what were commonly thought to be explosive bullets, but all of which on dissection were found to be either incendiary, tracer, armor-piercing or ordinary lead-cored missiles. Of the thousands selected out of millions thus examined only one single cartridge containing an explosive bullet came into my possession. That was a cartridge found in a German ammunition dump in the Argonne after the Armistice. It was adapted to the Austrian straight-pull Mannlicher rifle. It will thus be seen that we must look for the cause of explosive effects not in dumdum, soft point, or explosive bullets, but in the explosive energies of ordinary bullets either when undeformed and flying true or when deformed or flying erratically.

What are the principal "explosive effects" produced in tissues by undeformed high velocity rifle bullets flying head on? They may all be grouped for convenience of study into comminution of bone, the

"blasting out" of soft tissues at the point of exit, the pulping of soft tissues around the track of the missile and injuries to distant parts by energy transmitted through fluid. The first two of these were thoroughly investigated by the earlier observers, particularly by Lagarde, Woodruff and Beyer in this country, by Kocher in Switzerland, by Delorme and Chevasse in France, and by several Germans. So far as the variations in explosive effects on bones are concerned, I need to call attention to but two phenomena which together will explain the principal factors involved. If you press hard enough and slowly enough with your fist against the center of a window pane, you will crack the glass over its entire area before making a hole in the glass. If you fire a high velocity bullet through the center of a similar pane of glass, you will make a hole not many times the diameter of the bullet and with few, if any, cracks radiating therefrom. The outer portions of the glass will remain intact. The low velocity of the pressure in the first instance permits the energy to be transmitted throughout the entire area of the glass before the pressure ceases. The high velocity in the second instance relieves pressure before the energy has had time to be transmitted to distant areas. In the center of shafts of long bones this variation in energy release is the principal factor in the variation in fracture effects, providing, of course, the missile in each instance is flying head on.

If you fill a tomato can with small marbles and fire a high velocity rifle bullet through it you will find that some of the marbles will make dents in the can, but that the point of exit of the bullet will barely admit your little finger. If you fill a can with sand and fire a similar bullet through it you will be able to put two or three fingers in the hole of exit. If you fill the can with water and fire through it, the whole far side of the can may be torn out. Similarly in bones struck by missiles of the same velocity, portions of bone of high density show less local shattering than those of lower density, the shafts of long bones less than the head, etc.

The variation in the "blasting out" of soft tissues at the point of exit is a phenomenon which is explicable largely by a consideration of secondary missiles, that is the placing in motion of fragmented tissues, particularly bone. We must, however, not think of fragmented bone as the only secondary missile. The missile effects of even water from a fire hose in quelling riots is a matter of common knowledge. One can readily understand then how even fragments of the softest of tissues to which high velocity is imparted by a rifle bullet may become serious missiles in blasting out the soft parts around the point of exit. There is no doubt that the conical form of these blasted out cavities is due to

the direction in which the energy is transmitted. This is a resultant of several lines of force and depends upon the shape of the conical head of the bullet, and in some degree on the variation in the ratio between the energy of rotation and that of translation as the bullet is slowed in its passage through the tissue without at the same time being materially retarded in its revolutions.

One of the most difficult things for military surgeons to appreciate in the recent war was the pulping of soft tissues along the track of high velocity rifle bullets. Failure to appreciate this by any of the warring nations early in the war and by many American surgeons even as late as the summer of 1918, no doubt resulted in many instances in insufficient cleaning out of pulped and infected tissues with resulting gangrene and death. Our Cuban experience, owing to lower velocities and longer ranges, had not taught us the frequency of pulping effects with higher velocities and shorter ranges, and the experimental data were insufficient and unconvincing.

Most of the experiments had been either on the bodies of men or animals, or in such mediums as sand or clay, which do not readily lend themselves to an accurate determination of the distance to which the energy of high velocity missiles may be transmitted. In attempting to throw further light on the problem, I began a series of experiments in 1916 using gelatin of various known percentages as a medium into which to fire. These experiments were interrupted by call to active service in January, 1918, and though I have resumed them recently, my increased knowledge of wounds, gained during the war, has led me to see so many ramifications of the problems involved that I cannot look forward to the completion of the experiments in the near future. It may be of interest here, however, to report progress.

Gelatin was chosen because it is a translucent medium, the densities of which can be accurately controlled. I have used densities of 5, 10, 15 and 20 per cent of commercial gelatin in water. The hot mass is poured into cardboard boxes about $3\frac{1}{2}$ by $4\frac{1}{2}$ inches surface area, and about 2 inches deep. After the gelatin is cooled, the masses are fired through at a standard range of 50 feet, using the regular charge in the Springfield rifle. Besides observing the shattering of the gelatin masses, various other means have been taken to measure variations in dispersion of energy. Powdered charcoal has been placed on the surface of the gelatin and the distance to which the particles were driven into the gelatin along the track has been observed. A small area in the center of the mass has been filled with powdered charcoal, and the distance to which particles thereof were driven carefully measured (Figs. 1 and 2). Thin fibers of soft black darning cotton have been sewed back and forth

from side to side halfway up from the bottom of the box, gelatin poured in, and after being allowed to cool, the threads cut at their ends. With these, not only a practical definite measure of dispersion of energy has been obtained, but also the drawing effects on the threads has been observed (Figs. 3 and 4). These latter simulate the evulsive effects produced by high velocity missiles on fibers of connective tissue, the muscle bundles, nerve sheaths, etc. For the further study of this latter phenomenon a layer of very fragile black silk net, known by the trade name of "maline," has been embedded in the gelatin halfway up from the bottom of the boxes and fired through. The fragile threads of this net are not shattered but are drawn out from the woven fabric.

Now, these gelatin masses which have varied in their densities in a simple ratio, namely, 5, 10, 15 and 20 per cent solutions, have also varied greatly, and not necessarily in parallel ratios in their surface tension, their elasticity, and their viscosity. The variation ratio for each factor, however, has been uniform for that factor. Though this variation has no doubt been complicated, it has been extremely simple compared to the complex variations in density, elasticity, viscosity, etc., in the different anatomic structures of different men of different ages, different degrees of leanness or fatness, different degrees of contraction or relaxation of muscles and in different amounts of fluids in tissues, as well as in hollow organs. It is believed, however, that the general principles which may appear from the study of the distribution of missile energy in such gelatin masses are applicable to those phenomena which are met with in wounds in living men.

Without wearying you with the mass of details, on many of which observations are still incomplete, I may sum up the results of the principal observations so far as they have gone by saying that, speaking generally, and without any pretense of high mathematical accuracy, my experiments seem to show that the energy of a high velocity missile passing through gelatin masses of different percentage densities is dispersed in an explosive degree to distances approximately inversely as to the square of the percentage densities. That is, explosive effects are produced in a 5 per cent gelatin approximately four times as far from the bullet's track as in a 10 per cent gelatin, nine times as far as in a 15 per cent gelatin, and sixteen times as far as in a 20 per cent gelatin. Now it is no doubt true that a wave set up in gelatin masses of any of these percentages proceeds completely to the periphery of the mass, but it is not true that the gelatin is fragmented to the periphery, or that particles of charcoal are driven to the periphery.

These experiments on gelatin masses have been supplemented by studies on the effects of similar missiles in living and dead animal tissues

and by observations at the autopsy table on fatal war wounds. So far as one can estimate the relative densities of the tissues, the principles somewhat crudely worked out for gelatin seem to hold for cartilage, fibrous connective tissue, muscle masses and soft glandular organs. It has been impossible by the methods so far adopted to measure the dispersion of energy in fluids. However, certain effects have been noted, which will be mentioned later, and further experiments are now in progress.

The practical lesson to be derived from these experiments for the military surgeon's use is that wounds made by rifle and machine gun bullets of high velocity show destruction of soft tissues, even when no bone has been struck, at distances very much farther from the track of the missile than one would be led to suppose from his study of the effects of missiles of low velocity such as the older military bullets or such as revolver bullets, wounds from which are usually encountered in civil practice. It must be remembered also that increase in energy from increased velocity follows a very definite physical law, the energy of missiles being proportional only directly as to their mass but proportional directly as to the square of their velocity. Thus, a rifle bullet of 150 grains has only twice as much energy at the same velocity as a pistol bullet of half the weight, but if moving at a velocity of 2,400 f.s., it has sixteen times as much energy as a pistol bullet of the same weight, moving at a velocity of 600 f.s. Furthermore, this energy would be dispersed sixteen times as far into the tissue as would the energy of the pistol bullet. Thus, while it may be perfectly safe in civil practice merely to clean out superficially the track of the relatively low velocity 32-caliber jacketed pistol bullet through soft tissues, if in military practice pulped dead tissue is left in the track of the very high velocity 31-caliber Mauser rifle bullet serious results are certain to follow. This necessity for wide débridement was relearned by sometimes sad experience by the military surgeons of all nations in the recent war. It is hoped that it will never again be forgotten.

In addition to the pulping effects by transmission of energy laterally by a rapidly moving missile, the very great evulsive effects of the missile in ripping out fibers of connective tissue particularly from muscle aponeuroses and from the sheaths of vessels and nerves must not be lost sight of. This effect has been well illustrated in my gelatin experiments by the ripping out and tangling up of the enmeshed fibers of cotton and silk. That the rotary motion of the bullet may be a considerable factor in this effect is shown in Figures 6 and 7.

The second practical lesson to be learned by the military surgeon is that the softer the organ or tissue the further away from the track of the

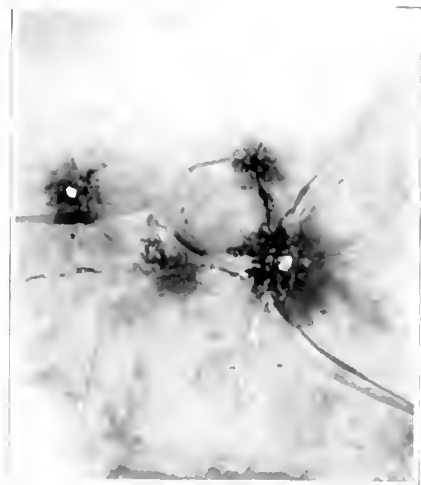


FIG. 1—Dispersion of powdered charcoal in 10 per cent gelatin by Springfield bullet at 50 foot range.

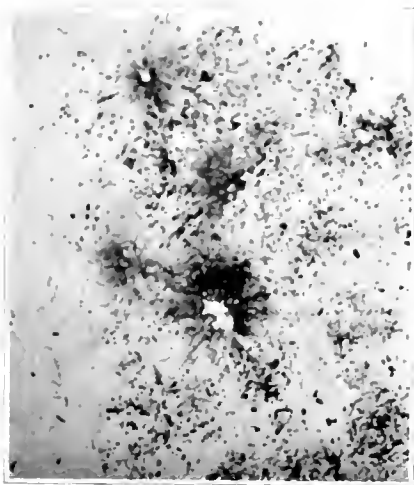


FIG. 2—Dispersion of powdered charcoal in 5 per cent gelatin by Springfield bullet at 50 foot range. Note that the charcoal has been driven about four times as far from the track of the bullet as it is in the 10 per cent gelatin (Fig. 1).



FIG. 3—Dislocation of threads in 10 per cent gelatin by Springfield bullet at 50 foot range.



FIG. 4—Dislocation of threads in 5 per cent gelatin by Springfield bullet at 50 foot range. Note that threads have been disturbed at least four times as far from the track of the bullet as they have been in the 10 per cent gelatin.

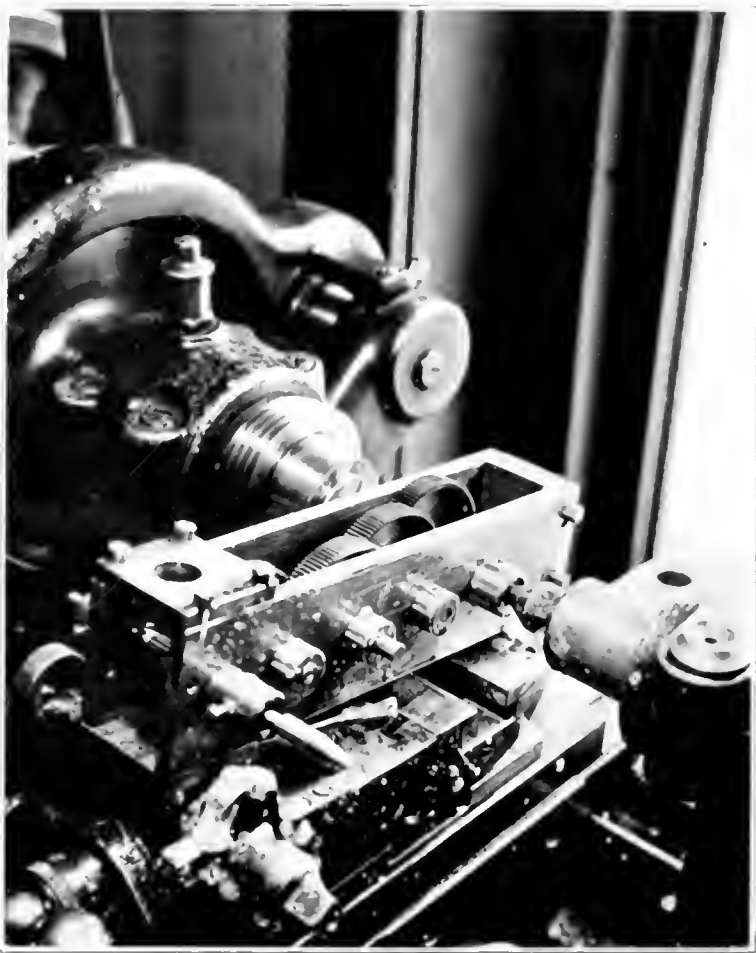


FIG. 5. Lathe-driven machine for spinning Springfield bullet at approximately normal rotation speed for experiments concerning rotation energy effects in wound production. Photograph taken immediately after an experiment showing how gelatin is scattered about thereby.

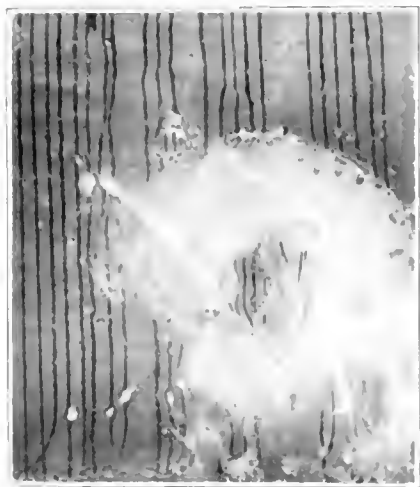


FIG. 6. Dislocation of threads in 10 per cent gelatin by instantaneous spin of Springfield bullet rotating at 178,000 r.p.m. in machine shown in Figure 5.

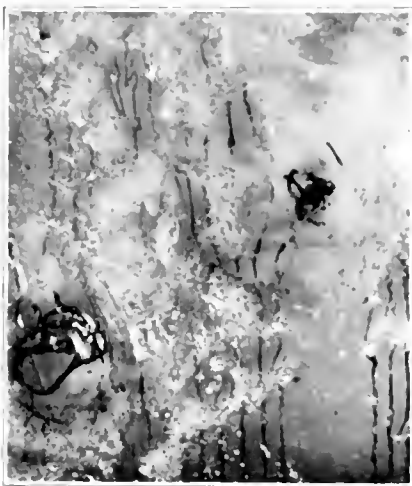


FIG. 7. Dislocation of threads in 5 per cent gelatin by instantaneous spin of Springfield bullet rotating at 178,000 r.p.m. in machine shown in Figure 5. Note that threads are disturbed at least four times as far from the point of insertion of the bullet as in the 10 per cent gelatin (Fig. 6).

missile will serious secondary results of injuries occur. The pulped tissue not only is almost certain to become the nidus for the growth of pathogenic bacteria which had been disseminated through it on fragments of dirt and clothing carried into the wound by the missile, but certainly the pulped muscle and probably also other shredded organs break down quickly and give out toxic products which according to Cannon's experiments are one of the causes of so-called secondary traumatic shock.

Soft glandular organs, such as the kidney, spleen, and liver and the nerve trunks, which have not been even touched by high velocity bullets may be seriously affected by the transmission of energy to them through intervening soft parts. This is of great surgical importance. It is a bit unfortunate that Sir Anthony Bowlby's Bradshaw lecture, in 1915, in which he quoted the observations of Stokes and McNee to the effect that the liver and kidney, for example, may show extensive interstitial hemorrhage and disintegration of the parenchymal cells at considerable distance from the site of obvious injury, should have stimulated certain British pathologists to deny the presence of these so-called "hydrodynamic" effects because in their experiments they had failed to observe them. Had they taken into consideration the great variations produced by relatively slight variations in density of the perforated mass and in the velocity of the missiles they need not have been misled. It is only when these factors are accurately controlled that one gets comparable data.

But it is in the production of minute injuries to the intima of blood vessels that one meets with the most striking results of the transmission of energy in mediums of low density and viscosity. Sir George Makins says: "Of all the experiences in the present war that regarding the frequency of occurrence of contusions (to the blood vessels) and the significance of this form of injury in the causation of thrombosis, secondary hemorrhage and traumatic aneurysms, is perhaps the most novel." This was written by a surgeon with extensive South African war experience and at the end of the recent war despite the statements by several British observers, in 1916, describing the improbability of such injuries. My gelatin experiments seem to indicate that the transmission of explosive energy is more directly related to variations in viscosity than in density, that is, the less the viscosity the farther energy is transmitted. Now, the viscosity of blood is very much less than that of 5 per cent gelatin. The distance to which energy of high velocity missiles is transmitted in 5 per cent gelatin is astonishing. How much more so then must it be in blood of yet lower viscosity. Makins figures these minute injuries to the blood vessels, notes that "the mischief may ex-

tend widely within the vessels from the spot where the external indications are the strongest" and points out the extreme importance of their relationship to thrombosis, secondary hemorrhage, and aneurysms. He does not, however, present an adequate explanation of the dispersion of energy in the blood which results in the distant injuries. While I am not prepared to make dogmatic statements in the face of the many hypotheses and lengthy discussions, particularly those of Teutonic observers, given in detail by Borst in the recently issued volume of Aschoff's "Pathologic Anatomy," I am convinced from my own experiments that the phenomenon is closely related to the relatively low viscosity and density of the blood and that it may be explicable along the lines of those principles of physics fairly well worked out by Worthington in his "Study of Splashes." The important thing for the military surgeon to bear in mind is that when a high velocity rifle bullet has passed through or even near an important blood vessel there are almost certain to be minute slit-like lesions in the intima, which may be scattered in areas far away from those parts actually touched by the bullet in its passage, and that these lesions in the intima, even if uninfected, may cause thrombosis, fatal secondary hemorrhage or slowly developing aneurysms. The lesions also may become the focus for the growth of bacteria which have found their way into the blood. When a rifle bullet has passed completely through and out of the body or of a limb, thus indicating its relatively high velocity, and either through or in close proximity to an important blood vessel, and when at the same time the tissue is evidently pulped at considerable distance from the track of the missile, the only safe surgical procedure is ligation of the vessel at a relatively long distance from the track of the missile.

At some future time I hope to present further experimental data on high velocity missiles with suggestions as to their surgical significance.

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REMARKS ON THE NEUROLOGY OF SYPHILIS*

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IN VIEW of the recent great productivity of articles upon the neurosyphilis, it seems almost superfluous to add another. However, it is evidently the consensus of opinion among the contributors to the literature that the subject is still in a state of fluidity, and that the last word is far from said.

It is not proposed to attempt the addition of anything dogmatic, but as conveyed in the title, to make some remarks in regard to this class of disorders, based upon a number of years' experience in this particular field, with the idea of perhaps supplying a few suggestions which may assist in elucidating the problems presented. These have been rather complicated by the variance in the conclusions made by conceded authorities.

Under the caption "neurosyphilis," is included only these conditions which were classed as meta or para syphilitic, or, if you will, the tertiary involvements of the neurologic structures; that is what were formerly considered to be complications or sequelae of the luetic infection. However, excluding the early effects on the cerebrospinal system, which, as seems to be quite well substantiated, presumably occurs in all cases, varying in degree, as a part of the general infection, concurrently with the secondaries.

There is no doubt that considerable of the apparent disagreement has been caused by the evident unreliability of the serologic reactions, as now performed and interpreted. This has been particularly true in their utilization to determine and govern treatment. Supposedly reliable laboratories submit reports on identical specimens which disagree, and these not in degree, but actually as to fact; that is, whether negative or positive.

This has been my experience in a recently referred case, where decision as to therapy, because of complications, is very serious. This condition possibly is due to many factors participating in these reactions, of which we are unaware. It may be that laboratory workers, in their praiseworthy efforts to simplify methods, have invalidated the test. There have been repeated alterations of the principle originally

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evolved, so that we read of the Smith variation, of the Jones modification, of the Wassermann test.

Krauss (1) states, "all the juggling done by the innumerable 'modifiers' has been to reduce the percentage of negatively reacting sera, ignoring Wassermann's margin of safety." This condition is unfortunate. It has served to place a valuable clinical adjunct in a suspicious light, if not in disrepute. There is no doubt that it is the best, if not the only, method, by which we can properly supervise therapy. The efforts made to standardize the test are commendable, because this is essential.

Credence should not be placed upon any test but the original, as formulated by Wassermann. If this is properly done, a definite positive indicates syphilis; of course excluding the several diseases which also produce the reaction.

We have yet to learn the mechanism of the changes in serum reactions, which occur with or even without treatment, and all the factors which alter them, and why in some patients they are quite evanescent, and in others practically fixed.

This brings us to the consideration of therapy.

A recent writer (2) has stated to the effect that more than ten years' experience with modern methods in the treatment of syphilis has not brought us to that much-hoped goal, a standard anti-syphilitic therapy. He adheres to the less intensive method of treatment, as the results obtained were the same.

This clearly shows that our knowledge of this matter is far from axiomatic. Utilization of practically all methods, including the various combinations, both intravenous, of mercury and arsenicals, and intramuscular of mercury, and of iodine, and intraspinally, the Swift-Ellis-Ogilvie method, and the mercurialized serum of Byrnes, also trials of intradural applications, as well as spinal canal drainage, and these extensively, selectively, systematically and carefully, have left me in a quandary as to just what treatment is best as a routine, and what indications should lead to variation.

Naturally the best method will be that which yields consistent and permanent results, with the least possible harm to the patient. This has not been attained, and we are not yet in a position to state the ideal treatment of syphilis.

Gongerot, (3) a dermatologist, believes that opinion is getting to be more and more in favor of large progressive doses of arsenicals in primary syphilis, but subscribes to smaller doses in neurosyphilis.

However, we should not be governed in our estimations, particularly of treatment, by the dermatologic conception of syphilis, but must

consider the intensive and later effects on the nervous system. This has been recognized by Fordyce, (4) who states, "In the past the dermatologist has emphasized chiefly the external manifestations of the disease and neglected in great measure the widely disseminated infection." Maybe this criticism fortunately is no longer valid, as many observers are now engaged in working out the problem of the general disease process in its relations to future changes in the nervous system and viscera. This is indeed a salutary trend and let us hope that it will prove enlightening.

There is no doubt that there is an ever-growing tendency among dermatologists to gradually convert themselves into what they term "syphilologists" or "syphilographers," and thus to take cognizance of the whole field of syphilis, including its neurologic manifestations. In several of our well-known clinics we see two units, the dermatologic and neurologic, engaged in treating these disorders, with the observer trained as a dermatologist, essaying to examine the eye grounds and nervous system.

Diagnosis should always be made, if possible, upon the dark field findings. It is not justifiable to await the production of the serologic reaction, any more than it was to withhold treatment until the onset of the secondaries.

Fordyce (4) also believes that, with our present understanding, treatment should be undertaken in the prepositive Wassermann stage.

Treatment should be continued until the findings at all levels are rendered reliably negative. No patient should be discharged until a final estimate of his spinal fluid is made. This has been emphasized lately by Moore (5). If the fluid shows a negative Wassermann, we may reasonably infer that we have successfully coped with the infection. The reaction of the blood serum is no criterion, as it may be negative in neurosyphilis.

The colloidal gold test (6-7) is of particular value. It must be done carefully and competently to be so considered. Application of Vernes phenomenon (8) may prove to be of value in diagnosis.

In neurosyphilis we cannot ever state positively that a cure has been made. All patients should have continued supervision, with laboratory checkages, at regular intervals for years. The best that can be hoped for is control.

Kirby (9), in a recent contribution based upon statistics from the New York State Hospital Service, concludes that there has been an actual decrease in the syphilitic psychoses, but suggests that the future will have to show whether early treatment will reduce neurosyphilis, but believes, that as with alcohol, syphilis is being reduced as a cause of

mental disease. While this is optimistic, and may we hope true, I am not so sanguine. We are familiar with the apt aphorism that statistics never lie, but statisticians may.

There are many bearings to be considered in settling the question. Is it not too soon to conclude that the neurologic sequelae of syphilis have been lessened by intensive therapy? Must we not carefully consider the possibility of damage to the neurologic structure by arsenical treatment, especially if following the idea of a "therapia sterilisans magna?"

It is a well-known fact that arsenic has a selective action upon nerve tissue, as is indicated by arsenical neuritis and encephalitis, and the many occurrences of optic damage following arsenical treatment. Kolrs (10) has reported a case of death from acute encephalitis after an intravenous administration 0.60 gm. salvarsan, which he believes was not due to previous syphilitic injury, but to the toxic action of the arsenic. However, Erlich (11) inclined to the opinion that these effects are due to rather complex causes. He recognized as one factor the presence of the syphilitic processes in the meninges, and capillaries of the brain, containing spirochetes, and that their destruction causes the delayed formation of endoxins, which are probably due to an altered form of the salvarsan.

Several investigators (12) have demonstrated that the distribution of arsenic in the internal organs is very variable. In one case the greatest quantity will be found in the spleen; in another, in the liver or lungs, and at times in the kidneys; this possibly being due to the fact that they were diseased and thus elimination was prevented.

Martin (13) believes that the untoward effects of arsenic or treatment may be due to allergic idiosyncrasy, anaphylaxis, protoplasmic sensitization from repeated doses, or the nitritoid reaction due to the destruction of spirochetes, thus liberating large quantities of protein substances to which the tissues become sensitized.

Who has not been confronted with the problem, in a syphilitic, where optic involvement occurs during therapy, whether to stop or continue? Here may be cited the aforementioned case:

A.—Male, white, age 52, United States, divorced twice. Had posterior urethritis at 23, which was very refractory, otherwise well until spring of 1911, when he developed patches in his throat. At this time Wassermann of blood serum was positive. He was relieved by treatment. Had two intravenous injections of salvarsan, and probably mercurial medication for six months. In 1913, had severe pain in right leg, which followed a cold bath, and he considered due to a neuritis. In April, 1920, developed rash which occurred thirty days after injection of an autogenous vaccine made from the urine. This he understood was given to relieve him of shreds which had persisted in his urine. At this time he had some difficulty in controlling his bladder. His serum Wassermann was found positive, and he was

referred for treatment, when the spinal fluid Wassermann was 4 plus. His treatment consisted of six intravenous injections of salvarsan, and intraspinal of the salvarsanized serum (Swift-Ellis), extending from June 15 to September 21, 1920. Immediately after the first injection he began to have trouble with his eyes, which, he states, had been perfectly all right prior to treatment. In June 18, 1920, he suddenly discovered that he could not see the hotel clock, which he had been accustomed to use. During July his vision became worse, and by August 1 he was almost blind. At present he has general pain, which he describes as shooting, and which occurs usually in the legs, but occasionally in the arms. He has no headache. Examination does not reveal any mental symptoms. There is a primary optic atrophy without inflammation, of both eyes. The right field is about normal, the left considerably contracted. O. D. 10/200, O. S. fingers at two feet. Blood vessels not contracted. Color perception gone. No plantar response. Patellars absent. No Babinski or clonus. No sensory disturbance. Cremasteric and abdominal reflexes present. Blood serum shows Wassermann 3 plus. Spinal fluid Wassermann 4 plus. Cells 7 per cmm, globulin increased. Colloidal gold curve in the luetic zone. Urine, acid Sp. G. 1008 albumen, faint trace; sugar, negative; micro. few pus cells and hyaline casts.

Must we conclude that we are still unaware as to what determines the involvement of the neurologic structure in syphilis? It has always been felt that there are a number of factors which must be considered as influencing the onset of these disorders. Alcoholism, traumata, overwork, emotion, sexual excesses; in fact, anything that impaired the resistance of the cerebrospinal system, have all been regarded more or less responsible. Also the opinion has been expressed that paresis does not occur except in those potentially insane; that is, the individual developing the disorder is one who is predisposed to mental disease, and this predisposition is the determining factor, and he has reacted to syphilis as he would to any similar infection, or in other words, in such cases the nervous system is the tissue of low resistance.

The work of Reasoner (14) and others showing different strains of spirochetes has been indicative. The likelihood of one of these being neurotrophic is important. This has been suggested in the literature by reports of conjugal paresis, and its occurrence in individuals infected from a common source. However, Thorn (15) has lately expressed the opinion that there is no such thing as "strains" of spirochetes, but that the idiosyncrasy of the individual and reaction of his tissues govern the selective action of the organism and account for varied forms of the disease.

It has been an impression that, in the intensive use of the arsenicals, especially in closely adhering to the idea of destroying the organisms instantaneously, there has not been sufficient consideration of the fact that, because of the selective effect of arsenic upon nerve tissue, there must be necessarily some damage caused to these structures, at least an impairment of their resistance, if not actual solution of their integrity.

This perhaps, in itself, is sufficient to allow invasion of the brain and cord by the organisms which survive the initial onslaught of the arsenic, especially as there would be a tendency for them to endeavor to escape the circulating arsenic, by seeking harbor in situations not easily reachable by the blood stream. This applies to the recesses of the neurologic structure. Erlich and Gemmerich (16) noted the involvement due to the spread of unsterilized spirochetes.

The toxicity of the arsenic is possibly augmented by the benzyl component in some of the preparations used.

To indicate that considerable damage may be due to intensive arsenical treatment, the following cases are quoted:

B. W.—White, male, 32, U. S., Medical history negative except gonorrhea 1914. Primary infection on lip in May, 1918, secondaries noted June 3, 1918. Macular papular eruption over entire body, general adenopathy. June 3, 1918. Wassermann reaction serum 4 plus. June 3, 1918, novarsenobenzol 0.30. Frontal sinusitis coincident. June 10, 1918, 0.60-Ki and Hg. June 13, 1918, novarsenobenzol 0.75. June 17, 1918, novarsenobenzol 0.90. June 20, 1918, novarsenobenzol 0.90. June 24, 1918, novarsenobenzol 0.90. June 27, 1918, novarsenobenzol 0.90. July 1, 1918, restless-noisy-severe headache-incontinence of bladder and rectum. Flaccid paralysis. July 6, 1918, is recovering sensation below waist line, and is able to slightly move legs. July 7, 1918, urinary incontinence. July 15, 1918, control of legs has improved slightly. July 25, 1918, unable to walk, arms and legs still paralyzed. Bladder and bowel control improved. August 30, 1919, slowly improving, walks with crutches. September 15, slight improvement. October 1, 1919, able to hold weight upon right leg. Less foot drop. Bladder control better. October 30, 1919, no change. November 7, 1919, sudden appearance of some control right quadriceps extensor—can extend foot on leg. November 20, 1919, walks about somewhat with crutches. December 15, 1919, improvement noted. January 5, 1920, no change. January 22, 1920, some mental depression. February 15, no change. February 27, 1920, able to walk a few feet without crutches. Muscles of legs improving. March 10, 1920, improvement noted. July 28, 1920, much improvement—no anesthesia—left leg not paralyzed, but much atrophy of thigh—right lower—paralysis of thigh flexors—partial paralysis of extensors. Some impairment of bladder and rectum control. August 16, 1920, slight improvement. August 30, 1920, slowly improving. September 30, 1920, slight improvement. October 15, 1920, improved control of bladder and rectum. Right leg is still paralyzed. He can flex thigh a very little and extend leg a very little; other movements have improved. Left leg all movements are present but weak. November 15, 1920, no anesthesia; good motions of all muscles of left lower extremities, with some weakness and atrophy of thigh muscles. Full motion of all muscles of right lower extremities; very poor flexion of foot; all reflexes present; bladder control still impaired. December 16, 1920, still unable to hold urine, when he gets sensation to void. Movements of left leg stronger. Flexion and extension of right foot good. Poor flexion of right leg and inability to raise the extended leg. All reflexes active but weak. January 6, 1921, Wassermann reaction blood serum and cerebro spinal fluid negative. Colloidal gold test; no curve. January 10, 1921, improving. January 20, 1921. About the same. February, 15 1921, improving. June 1, 1921, sudden return of entire control of right foot. General condition good. Improved.

L. H. White, male, 19. Medical history negative. Exposed infection, Colon, August, 1920. Primary lesion noted September 5, 1920. October 1, 1920, Wassermann Blood serum, 2 plus. No secondaries noted except pharyngitis. October 4, 1920. Began series 9 intravenous injections arsphenamin 0.4 every 5 days. Daily injections of lig. and potass. iodide internally. On November 20, 1920. Typical signs "locomotor ataxia." Noted ataxia, absence deep reflexes, Rombergism. Pains in leg muscles, hypotonia Argyll-Robertson pupils. February 24, 1921. Mental examination, moron. Some impairment station and gait. No pupillary disturbances. Patellars present, but sluggish. April 21, 1921. No signs of organic neurologic involvement. Wassermann reaction blood serum negative. Refused spinal puncture.

S. J.—White, male, age 25. Medical history negative. Exposed infection December 21, 1917. Primary lesion, January 11, 1918. Mercurial treatment by injection; course six. January 24, 1918, neosalvarsan 0.30 gm. Wassermann reaction of blood serum four plus. January 28, 1918, Neosalvarsan 0.60. January 31, 1918, Neosalvarsan 0.75. February 4, 1918, Neosalvarsan 0.90. February 21, 1918, Mucous patches. February 15, 1918, 24 Mercury rubs started. July 24, 1919, Chancroid with infection of inguinal lymph nodes. August 4, 1919, Novarsenobenzol 0.30. August 7, 1919, Novarsenobenzol 0.60. August 11, 1919, Novarsenobenzol 0.75. August 14, 1919, Novarsenobenzol 0.90. August 18, 1919, Novarsenobenzol 0.90. August 21, 1919, Novarsenobenzol 0.90. August 25, 1919, Novarsenobenzol 0.90. August 28, 1919, Novarsenobenzol 0.90. With six injections mercury succinimide. September 5, 1919. Complained of pains in legs, which caused difficulty in walking. There was moderate nephritis. Pain in legs became aggravated, also gait. There was numbness and feeling of tingling in hands and feet, could not walk unsupported. Grip became weak, hands and feet numb, plantar reflex absent. October 6, 1919. Pains and weakness of extremities, atrophy of muscles; all tendon reflexes absent, wrist drop. Serum Wassermann negative. Spinal fluid Wassermann negative. The clinical signs gradually improved. January 15, 1921. Wassermann spinal fluid negative. Cells normal, globulin normal, colloidal gold test, no curve.

Another factor which should be considered is, that as a result of treatment there is evidently caused what may be likened to a negative phase, the Herxheimer reaction, due to stimulating activity of non-sterilizing doses of arsenic. Does this not, particularly with intensive dosage, cause damage additional to that from the arsenic?

This should be evaluated and probably is important, as in the case of a retired Army Officer, seen several years ago, in whom it had been discovered that there was a positive Wassermann reaction of the blood serum, and subsequently a 1-plus reaction in the spinal fluid, with slightly increased cell count and globulin, and a suggestive colloidal gold curve.

Thereupon he was subjected to intensive treatment, following which there was a lessening of the findings at the clinical and laboratory levels, but he had a cerebral apoplexy, following which there was rapid deterioration and termination in about three months.

It occurs to me, that in a patient, along in years, with positive findings, who is not showing clinical symptoms referable to syphilis we should hesitate in instituting intensive treatment just because he has a positive Wassermann reaction, as we may activate a process which the individual is successfully handling and which without interference he might continue to do for years.

Oftentimes when positive reactions are revealed, there is too much of a tendency to treat them, rather than the patient. Some of us apparently become obsessed with the idea, that they must be made negative regardless of effects. It is similar to the conceptions extant upon blood pressure.

I have seen a number of patients, who as a result of seductive advertising, captioned like an oil promotion, in the guise of a philanthropy, come to the attention of the Peace Destruction Institute, or some similar organization, as a result of which they were made aware of clinical or laboratory findings which were not symptomatic, and which caused them to give up lucrative businesses, which they were capably conducting, to become devoted to the care of their blood pressure or a I-plus Wassermann reaction.

Involvement of the nervous system occurs coincidently with the secondaries. In cerebral, cerebrospinal, and spinal syphilis, there are active luetic lesions of the meninges, and the vessels of the brain and cord. In paresis and tabes dorsalis the parenchyma of these organs has been invaded by the spirochete at sites more or less apart from the blood vessels. This condition presents a hopeless prognosis, as it is impossible to reach these areas because of the inability of the medications used to permeate the capillary walls. Eliminating those cases in which there occurs the well recognized remissions regardless of treatment, treatment will only be of value in cases in which the parenchyma has not been involved, there it should be utilized to the utmost.

However this course is sometimes fraught with menace, as in a case of paresis which showed characteristic findings at all levels. Intensive treatment resulted in a remission accompanied with such clinical improvement that the patient was discharged from custody, by a jury, through a writ of habeas corpus. While at large he married and impregnated the woman. In the course of several months he was re-committed. There is no doubt that here, treatment certainly was not only valueless but damaging in the social sense.

In paresis it is possibly indicated to treat cases, where the social factor is important. Such as happens in the military services, where the income of a family is dependent upon the continuance of the patient, and then only in the hope of provoking a remission.

In connection with syphilis of the nervous system, but more particularly in regard to paresis, there is a phase that is especially of interest to the military services. This is the question of line of duty. Some years ago, early in the wave of attempts to control the behavior of others, and which has terminated in our present state of dessication, through the urge and efforts of a few uncompensated individuals endeavoring to obtain outlet for their derailments, and it is always the reformed roue who is most avid, the army and navy had wished upon them a penalization for those infected with venereal disease or ill from indulgence in alcohol, these being attributed "to their misconduct and not in line of duty." Perhaps this may be advantageous, and I shall not go into the question of its merit or equity except to state that in applying it to paresis, might we not be doing an injustice? Frequently men have been admitted with this syndrome, in whom no history of primary lesion is obtained, and who have given perhaps 18 or 20 years of valuable service, for it is only such that come to our attention with this disorder, who may have dependents, and when the diagnosis is made, because of this ruling are deprived of their pay and such perquisites as would obtain if they had some other disease such as tuberculosis, which is regarded as being in line of duty.

In view of the fact that we cannot say what is actually the determinant that causes a syphilitic to become a paretic, should not the men in all cases be given the benefit of the doubt, especially when such a large number of syphilitic infections are innocently acquired?

White, (17) some years ago, stated to the effect that no officer with a positive Wassermann should be in a position of command. It would seem desirably to amplify this to the extent that no officer who has luetic involvement of the nervous system should be retained at all. The potential danger is too great. At times the onset of paresis is insidious and beyond the awareness of his associates, even the medical officer. One cannot say when the neurosyphilitic may become a menace, and the likelihood is greater if he should be subjected to the stress of war, when his responsibilities would be greater and his integrity should be more assured.

This connotes what was stated above as to the undesirability of penalizing these disorders by forfeiture of pay, which is particularly true from the military viewpoint, as it results that officers conceal syphilis from the medical officers and obtain extra service treatment and the service only becomes cognizant of the situation through the occurrence of some untoward circumstance.

This is well exemplified in the following case of an officer detailed to aviation.

M. W.: Age 41 years, married, no children. Occupation mariner. Denies venereal infection. Medical history negative. Physical examination, January 30, 1920, reported negative, also negative on June 1, 1921.

On June 7, 1921, he was admitted to sick list with diagnosis of psychosis, presenting hysterical condition and some mental confusion.

He was transferred to hospital where he stated that while at air station, Coco Solo, C. Z., he had such a large amount of work to do that he began to get tired and very nervous. One day he crashed in a plane but did not injure himself or other occupant, but became too nervous to fly. He was subsequently transferred to the Air Station at Rockaway Beach. Here he could not do anything to the satisfaction of his superiors. Following an accident which involved damage to a hydroplane, he was requested to make a report of the circumstances. He was unable to do so, and had a marked psychogenic reaction to such an extent that his wife and associates believed him to be crazy.

Stated that he had not slept well for a month, has had increasing headaches over a period of two months.

Examination June 30, 1921. Argyll-Robertson pupil, anisocoria, speech disturbance, exaggerated reflexes. No active mental symptoms but only moderate insight. Memory sluggish. He is nervous and easily tremulous.

Wassermann reaction blood serum negative. Cerebro spinal fluid, Wassermann reaction positive in all dilutions. Globulin marked increase. Cell count markedly increased. Colloidal gold test. Curve 5.1.1.1.1.3.2.2.1.1.

In view of clinical signs and symptoms the diagnosis is neurosyphilis.

There is no doubt that this man showed indications of involvement of the nervous system one year before diagnosis was made. During this time he had acted as an instructor in aviation. The possibilities are too evident for discussion.

This case seems to show the necessity of frequent neurological examination of officers and men engaged in duties where much depends upon their mental integrity.

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SYPHILIS AND VENEREAL DISEASE—A SERVICE LIABILITY¹

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THIS PAPER is not presented with the idea that anything new in the management of syphilis will be developed, but to sound a warning, especially to those of us who have to handle people on detached duty, and to draw attention to how the law which demands checkage of pay of venereal patients is affecting their treatment.

During the past two years the G. U. Service of the Brooklyn Naval Hospital has been a most active one, and the officials of that service have had ample opportunity to study the psychology of the venereal patient and get some idea of the value of the law which was passed with the intention or hope of preventing venereal disease. From the beginning of history almost every known method of punishment has been tried on the prostitute, and she is still at work and constantly spreading her disease, and it is our firm belief that the law as it now stands does little if any good in the prevention of disease, and actually is productive of harm in that the man who does become infected delays reporting as long as he can, for he knows his pay will be taken away from him when he does report, and if he is a hospital case that also his liberty will be taken from him and that he will be required to do a considerable amount of work around the ward while he is a patient. Hundreds of times men have complained about having to work without pay, and I have often wondered how I would feel if I were in their position. Let us suppose any one of us were placed in the unfortunate position later described, and then imagine how we would feel. This human interest story is not the only one by a large number I could tell, and might happen to any man.

A patient was admitted with an initial lesion of syphilis on the glands; the diagnosis was established by the accepted methods and his pay checked in the usual way. This man objected strenuously to the action, but was reluctant to explain in detail. When he had an opportunity he told me his story. Three weeks before he was admitted he married; and he swore that he had not been exposed to infection with any one except his wife. His story rang true, and I consented to examine his wife. No signs of an initial lesion could be found, but she had a fading rash and general adenopathy, mucous patches on the tonsils and

¹ Read at the 29th Annual Meeting of the Association of Military Surgeons of the United States at Boston, Mass., June 2-4, 1921.

in the vagina, and a four plus Wassermann. Rather than have it generally known that he had been infected by his wife, he submitted to the checkage, and left the service at his earliest opportunity. Of course his disease was venereal, no act of duty to the Government involved when it was contracted, and nothing to do but follow the order.

No story is too improbable to be true as to how syphilis can be contracted. Another case in point: An officer in command of a ship was accustomed to drink from the glasses used by the signal boys on the bridge. Evidence was presented that one of his quartermasters had an active syphilis at the time. He became ill and was sent to the hospital and for some time remained under an undetermined diagnosis. A routine Wassermann showed four plus. He gave a history of obstinate sores on his lips for several weeks, no rash, no adenopathy, only a four plus Wassermann. Diagnosis of syphilis was the outcome. He was given the routine treatment and sent to duty where he remained for a year and a half without consulting a medical officer. On his return to the hospital for some other complaint it was noticed he had not been taking treatment since his previous discharge, and such was immediately started. During the course of his illness it was deemed advisable to do a lumbar puncture. The fluid was found to be four plus. When he was eventually sent to duty all laboratory tests were negative and no definite neurological symptoms could be demonstrated. It was the opinion of the neuropsychiatrists that he was unfit for further command, or duty involving responsibility; on account of central nervous involvement. This was based on most indefinite neurological findings and a four plus spinal fluid. On what was at the original admission believed to be sufficient ground he was given "In the line of duty." An opinion was rendered that the time from his original admission to date was too short for the findings already mentioned and that his disease, of necessity, must have been present for several years. We know now that two well-known observers report that 2 per cent of their cases show a positive spinal fluid in the primary stage of the disease. The original decision of "Line of duty" was reversed, and "Not in the line of duty" substituted; but his pay not checked, as the disease antedated the order. These facts are not cited in criticism of the action, for I believe that the medical officers did their duty as they saw it, but to call attention to the fact that the burden of proof was placed on the patient to prove where, how, and when he became infected and to show that an act of duty was involved. This I believe to be a fundamental wrong. The patient is asked to perform the very thing that we, equipped with medical training, cannot do. It may be, and doubtless is, the letter of the law, but I do not for a moment believe it was intended to work

in this fashion, nor do I believe it is for the best interests of the Government. I know that it works a hardship on the unfortunate patient, and I believe it is a hindrance to the problem of public health. (Stokes of Mayo's clinic; Black of Johns Hopkins clinic.)

The officer mentioned happened to be a reserve officer, and had given only a few years to the service. But let us suppose, for sake of argument, his position reversed, and that he happened to be a Lieutenant Commander who had devoted his whole life to the Navy; that his training was only Navy training and that he was unequipped to perform any other useful occupation or had not the necessary preparation to carry on in civil life; that his disease unquestionably developed within the time limit of checkage for misconduct; that he was so badly disabled that he could not earn his living, and his family dependent upon him for education and support. Remember that this officer has given the best years of his life to service and that when he first came into the Navy no mention of such a law had ever been made. He is being forced to prove his contention of "Line of duty," and there is no evidence of a genital lesion. Doesn't it appeal to you that the law is unnecessarily harsh and its operation is likely to have a demoralizing effect, not only on the patient but on all his friends, and that the Medical Corps is likely to be discriminated against and will place a barrier between it and the man? A large measure of the medical man's part in the scheme of things will be lost to him, to the patient in not being able to quickly and intelligently advise and to remove, as much as possible, the worry incident to the shock of knowledge of infection, and to the service as a whole as the friend and advisor of the sick and wounded.

The erroneous diagnosis of syphilis should be a matter of great concern for obvious reasons, and under this heading a few cases will be mentioned. A man admitted to our service under the diagnosis of syphilis, and every clinical reason for such diagnosis, including a mildly positive Wassermann reaction, was present. After a reasonable time had elapsed it was found that pemphigus was the correct diagnosis, and it led to his death. Who can positively say that syphilis was not the cause of his pemphigus?

Pityriasis rosea has been called syphilis so frequently that we have long since lost count of the number, and, when associated with an ulceration or a scar on the genitals or a history of previous venereal infection, might easily be mistaken for the rash of syphilis, especially when the medical officer lacks experience in diagnosis of skin diseases and has no laboratory to aid him in such a case.

What has been said for pityriasis rosea applies to almost any skin condition one cares to mention, for we all remember the dermatologist's pet phrase, "Syphilis is the anatomical ape."

Not long since a patient was admitted with syphilis which he had had for six weeks and from which he was supposed to have developed a cord lesion. He was under treatment for some time by the usual means, and finally sent to our service. A consultation was held and it was the opinion of the neurologist that he had a transverse myelitis in no way connected with syphilis. This man was the sole support of a family and was without pay for nearly a year before the mistake was corrected, and his family and himself had been objects of charity for this time.

He will eventually get his back pay, but it will be a long and disappointing experience, as any of you who have had an occasion to make a claim to the Auditor can testify.

Another case diagnosed as primary syphilis was treated in the usual way, and after four doses of salvarsan in rapid succession developed a neuritis, both legs, which has disabled him for nearly two years, during which time the only money he has had has come from relatives who could ill afford such expenditure. Again the neurologist agrees, and it is the opinion that the neuritis is the direct result of poisoning by arsenic, which was given for the cure of syphilis. No one questions this opinion, and everyone falls back on the order and says that had he not become infected he would not have been given arsenic and would not have had arsenical neuritis.

An occasional case of optic neuritis has been seen following salvarsan administered for syphilis, and the same reasoning always applies in these cases, as it also does when one of the extremely unfortunate cases of dermatitis exfoliativa develops while the patient is under treatment. These complications require prolonged hospital care, and convalescence. It is during the latter period that the lack of money to the man is little short of a calamity. Sick physically, in need of rest and change of environment, a keen desire for diversion and no money to gratify this wish—Who can reasonably blame the man whose intellectual development has not reached the plane of higher ethics from being disgruntled over his lot? Distrustful of all medical officers, ready to growl about the way he has been handled, and likely to sow discontent. The question naturally arises: How would you react to such treatment?

This brings us to another phase of the question. A man becomes infected, is sent to the hospital and is given intensive treatment for such a period as is deemed advisable. He is discharged to duty, and is about as likely to be assigned a ship with a medical officer as to a tug where there is no medical attention, and unless he is above the average for intelligence takes no more treatment until driven by necessity, or some medical officer discovers, by looking through his record, that he is a syphilitic. Then he is given treatment until he is transferred, and it

may be, and frequently is, his luck to go where he cannot get regular attention. He naturally shuns going up for treatment, for he fears he will lose his pay or have his liberty restricted. Eventually something makes him sick. It may be gastritis from overeating, a headache from constipation, or any one of a hundred of the more obscure complaints. What then? It is discovered that he had syphilis some time ago, and he is readmitted with the disease and bundled off to a hospital. If he has been well treated in the meantime he is lucky, and it's only another course of "shots," with loss of pay and plenty of odd jobs he hates. Perhaps he came in with an indefinite fever for which no other cause except syphilis can be found. It's his for the G. U. Service again.

The number of cases returning to the hospital after a few months or years lapse of time since the primary infection, who give a history of inadequate or no treatment, is almost beyond belief. And what is more startling is the attitude they have developed about treatment. This applies to both officers and men. Since the Armistice and demobilization I have seen many men who served, and have listened to the stories of the war; and many, many times heard the story how the medical officer was fooled about venereal infections, by the patient going to the civilian practitioner and getting "fixed up." And I have almost as frequently listened to how he didn't get "fixed," to how disappointed he was when he got a recurrence of the infection, or the innocent chancreoid proved to be a chancre. How he was forced to neglect treatment when he was on a destroyer, or cargo ship, without a medical officer; or who did not know the real truth until he was sent to the hospital where the diagnosis was made; of how he would have reported his trouble, but for the fact he might lose his ship, or, what is worse, his pay when a family was dependent on him for support.

The advertising "private disease" quack is reaping a rich harvest from these people. It is difficult to find out how many go to them, but I am led to believe that a goodly number of people on ships where there is no medical officer resort to this practice. They consider it cheaper to have the "advertising specialist's" opinions and care than to have the service doctor's attention and loss of pay. If the man could always select a competent doctor I would quite agree with him that it is cheaper to have civilian attention.

One does not have to coax a lazy imagination to see that a great amount of suffering has been thus caused and that a disease if treated efficiently and early might have been cured, and not become a possible source of danger to some other unfortunate individual. Then, too, the chance that many of these cases on account of neglect may progress to the incurable ones, and the luckless sufferer end his days as a helpless

invalid, or become hopelessly insane and add to that already burdensome number of incurable unfortunates. Let us imagine one of these neglected patients with an active system of delusions impelling his actions, and a meeting with the officer who first diagnosed his case. Many a good man has lost his life by the act of an unrecognized lunatic. Why couldn't one of us meet the same fate?

Sadder, if possible, than the above is the domestic tragedy already enacted with some of which I am familiar. The essential facts were discovered when the usual allotment was stopped and investigation started to find why this was done. Of course it was naughty for the man to contract his disease. Did it help the patient for a fond mother or a proud father to learn of his misfortune and possibly be a continued source of irritation by carping criticism of his moral obliquity?

An alarming percentage of infection occurs in the recruit. And this suggests to us the fact that a great many of our patients are recruited from the rural communities, where opportunity for promiscuous sexual life does not exist or is present in a limited degree, or is well known and warned against. Venereal disease is less rife among the rural population than in the urban community, and is frequently non-existent. If the youngster does stray from the generally accepted standard of conduct his chance of infection is infinitely less than when he has a lapse of morals and "takes a chance" with some dance hall beauty or the girl of the street.

This unlettered, unsophisticated, rustic youth signs the necessary papers to get into the service, and is immediately sent to a training station or to the post; there to be moderately worked, excellently clothed, better fed than many of them have ever been in their lives on a high caloric ration, and to associate with every kind of boy extant; away from his natural environment, living an unnatural life—at least when he goes to sea—there to associate with older and more experienced men in the ways of the world; to visit foreign ports, meet strange people with a different code of morality to our own, taste new liquor and drink strong, heady wines, have some seductive woman practice all the cunning and guile of her age-old profession on him; and because he reacts normally to the stimulus of the young, virile sex organs he is made the prisoner at a court-martial and loses his pay while he is undergoing treatment for his infection; while half a hundred of his comrades do exactly as he did and were fortunate enough to escape infection.

This youngster may have listened to a dozen or so lectures by the chaplain or the doctor, about the moral side of life and what might happen if he did indulge in sexual intercourse. He has been told that 100 per cent of the prostitutes are infected; which they are not, or

anything like that number; and he hears that this comrade or the other has had repeated intercourse with some woman and escaped infection. Finally he gets the idea that the whole thing is a gigantic fraud, and one day he slips—to his temporary, if the average, or everlasting regret, if he happens to be well informed. He has been vaccinated for this, inoculated for that, until he realizes he has as much privacy as the latest ape man in the circus; and all unconsciously we are giving him the very psychology he develops but shouldn't have. Truly this bucolic youth is a fit subject for somebody's serious concern. Instead of being herded to a venereal farm, a quarantine camp, or isolated building, to be avoided by all the non-infected people, deprived of his liberty, money, and amusement, and to be generally ordered around by some officious nurse or some executive or commanding officer who has forgotten he was once young and irresponsible or has repented of his shortcomings and wants to reform everything from styles in woman's dress to the kind of breakfast food we shall eat. Truly the venereal unfortunate has reasonable cause to be a source of trouble to everybody who attempts to handle him.

I am reminded of the Scotch poet's expression when he says in "Man Was Made to Mourn":

"Man—whose heaven-erected face
The smiles of love adorn—
Man's inhumanity to Man
Makes countless thousands mourn."

—BURNS.

My contention is that the unnatural life of the service and absence of home and community restricting influences are responsible for a lot of our venereal disease. They are a logical service liability, and there is a badly needed reform in our handling of these people. Let us be more human with them and see what can be done by that method, for with others we must admit we have made slow if any progress, and have a grave responsibility, and are at least answerable to the civil community by passing on an economic problem for the state.

These people are leaving the service upon the expiration of their enlistments and must be cared for whether we do it properly or not. If they could be made to see the advantages offered by service care until they are no longer a source of danger to themselves or as nearly as possible to unborn children, a great advance would be made in the fight against this menace to civilization. To remove this law will help a great deal.

The man, still of use as a soldier even though veneralized, can carry on his treatment under the country's most competent men.

The past century will be known as the most progressive period of human history down to the present time. Never has genius been more productive of invention and discovery. The earth, the air, the chemical elements, the sea, and physical forces in many forms have been controlled and made to serve man. The mind seems to have conquered everything save man—himself.

"Compared with our astounding progress in physical sciences and its practical applications," says Alfred Wallace, "our system of government, of administrative justice, and of national education, and our entire social and moral organization, remain in a state of barbarism." When we think, without prejudice, and not along preconceived lines, of the situation, we of the military medical profession stand convicted before the bar of human justice.

Most of the people who make laws and are supposed to dispense justice are devoid of knowledge of the forces which govern human conduct, of the history of man, or what can be expected of him, and have entirely lost sight of the psychology of human nature.

Practical psychological results are seen everywhere, as evidenced by the various reforms in penal institutions, manufacturing establishments, and advertising. A much greater part was played by applied psychology in the conduct of our war-time work than will ever be recognized by the average individual, and will in the next few years cause more radical reforms than we now believe possible.

There never was a time when there was more social, moral, or educational instability than the present, and this seems the time to forget the past and face the future. However excellent our prevention record during the war, we must admit practical defeat and attempt to devise better methods.

Strong, healthy young men, such as compose armies and navies, never were and never will be repressed by fear of infection, courts-martial, or any other means when opportunity for indulgence presents itself. And such is much more generally present than many will admit. The excellent record was compiled not by laws against indulgence but by actually keeping them away from infection. Our motto should be, "What we may do and should become; rather than what we have been and what we have done."

If we must regulate somebody, and enforce some law, let's get one of a different character and see what it will do for us.

For one to criticise without offering a remedy is unpardonable; so it is suggested that the opportunities for indulgence be restricted as in

the late war, thorough knowledge of infection taught, means of prevention provided in a convenient form and at trifling expense, and substitute for the present law, a law for compelling prophylaxis, or punishment if infection occurs and none was taken. Then if the man becomes infected, and he will, treat him as considerately as any other class of patient and see how quickly his attitude will change. It certainly can be no worse than it is now, and we may be able to retain most or all such men until they are no longer a problem to society and an economic burden to the state.

Fabulous sums were spent in welfare work during the war, and I believe this will be a paying proposition and in every respect for the best interest of the patient and the Government.



MILITARY NEUROSES — GENERAL AND FUNDAMENTAL ETIOLOGY

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WITHOUT making any defense for the word Military, instead of War, it is desired that it should embrace the whole class, in which military action as a national or world affair can be presumed to act in the pathogenesis. As to the other word, Neurosis, it is intended to embrace what strict classification might put under psycho-neuroses as well, and possibly cover some of the milder psychoses.

These neuroses are not confined to men who have been in actual service, since war, especially when it rises to the magnitude of the one recently ended, affects the entire population, civil as well as military. The spirit which we are wont to include broadly under the term "patriotism," affects boys and girls, and men and women, of all ages, the only criterion being, that there should be a conception of something transpiring, which is in a way large, extensive, unusual, and is calling on all sides for changes in conventions and standards. Some see that painful partings are likely to come, or have already transpired; others that there are opportunities for altruism which must be embraced with the utmost enthusiasm and endeavor; others, chances for gratifying ambitions, for fame, for distinction, for money or adventure.

Then there is the class, always fairly large, that secretly, insidiously or openly, antagonizes the prevailing and laudable spirit. The propagandist, the profiteer, the pacifist, the hyphenated citizen, the spy and the traitor, all appear, and in their trail, distrust, suspicion, surveillance, prosecution and persecution follow. Brothers, fathers and sons, neighbors, and public officials, dispute, quarrel, hate, and become revengeful and persecutory. And all this not where the war is being fought, or where the military training is going on, but in the home, at the fireside; in the metropolis and in the remote country village. Everything is on a different base, from that which exists in times of peace. The old code of morals, the ties of affection, and the usual obligations nowhere seem to quite hold.

But now let us go to camp, where training is going on; where are gathered the hundreds of thousands whose characters have not yet fully crystallized, under conditions of discipline, subordination and association, which they have never experienced. And again other thousands who have torn themselves, or been torn away from all that has been dear to them, and from the successful development of their

vocational careers, with the indifference and desperation thus engendered. Then the necessary firmness, sternness, harshness, and possibly even cruelty or brutality of commanders. The homesickness, the indolence, the vicious associations; the relief from the salutary restraints of the home and civilian society; the surrender of all obligation to support themselves or their dependents.

Take another step and go to the front with its awfulness, its horrors, its atrocities, its lust, its arson, and rapine, sickness, misery, wounds and death, and all constantly reflecting on the conditions at home, and we can in an abstract way conceive of the vastness of the operation of causes which affect mind and body.

We must not altogether forget to look at the reverse side of the picture. To grant that in war, the noblest and greatest instincts of humanity are developed and fostered. That the glorious achievements of history have constantly come through this agency. That innumerable men and women have been fortified and strengthened in their characters; that many who probably otherwise would have degenerated into indifferent or worthless individuals have been thus rescued and made efficient or possibly distinguished. The impetus to art, literature, science, discovery and advancement in ethics, in commerce, in government, is great and incalculable. The heroics of war well deserve the thought and the inspiration of the philosopher and the poet.

All these influences are not confined to war-time alone. They more or less anticipate its actual occurrence, and continue with tremendous force long after armistice and peace; possibly through all time.

Professor Balkanye, of Budapest, has recently called attention to the changed habits of domestic animals, as affected by the war. Cats and dogs seem to have lost their interest in their homes and owners, and have become vagrants.

The poverty, the hunger and starvation of Europe, the crime wave in our own country; the social and economic unrest everywhere, are not only now morbidly affecting mankind but will reach far into the future.

Coming to consider somewhat specifically those cases of neurosis, which were engendered by military service, their nature and severity will be found to be largely determined by:

a. Character, disposition, and physical condition prior to entering service.

b. Physical and psychical condition operative during service.

c. Character of medical management during their period of enlistment.

d. Domestic and other conditions, encountered on returning to civil life.

c. Character of medical management since discharge.

Character, disposition, and physical condition prior to entering service.

During the war, I was always of the opinion that many of the shrinking, bashful, and rather timid young men, who had been shielded by their parents and guardians from all hardship, and pampered under the belief that they were nervously weak, should not be exempted in the absence of adequate physical defects. There were many physicians especially, among the neurologists, who believed that neurasthenia, if established, even though mild in degree, should exempt. I think the records would show, though I have no statistics at hand, that many of this class found in camp life and in military discipline the most valuable therapy that could have been applied. Undoubtedly a great deal depended on the experiences they met with.

There was however, a large class, in which there was defective heredity, or acquired neuropathy, in which the system and character of inspection might have been such as to exclude at the outset a quite large proportion of this huge contingent which is now, or will become, beneficiary for disability.

Many come to us with relation of shell shock, with absolutely no direct traumatism, vague and indefinite as to the way they were immediately affected, but dating the onset of their symptoms from there. There is often comparatively little check on their veracity, and without at all doubting them, we may yet conclude, if it had not been for possibly a repressed fear, resting in them unconscious, they would have been no more, if as much injured, as the average man when he slips on a banana peel, but escapes without fracture, dislocation or bruise.

PHYSICAL AND PSYCHICAL CONDITION OPERATIVE DURING SERVICE

There are histories of very severe tasks and drills of the most arduous campaigns, and of strain on the physical endurance from which none but the strongest could escape without the most profound exhaustion, and such can easily result in a chronic asthenia if there should be a defective nerve substratum. In some there has been humiliation by an officer, exercising his power and authority with none too much discretion, or the gibes of comrades may have been operative. It is easy to see how hate repressions here become achieved.

Then on the physical side, there are actual injuries, many of a slight character so far as the apparent trauma is concerned, which recover according to the records, but which have a ground work on which a neurosis or psycho-neurosis is very frequently erected. In the severe forms of injuries, there are often complications of the organic and

crippled conditions which we find. Shell shock, gassing, and superficial wounds figure in the former, while gassing also enters into the latter category, along with every form of injury short of a mortal one.

On the psychological side, we need only mention the distaste for, and the uncongeniality of the life to many, the long-continued home-sickness endured by others, the sad and bad news from the home circle of some, and the anxiety regarding the future of the business or social prospects.

CHARACTER OF MEDICAL MANAGEMENT DURING THE PERIOD OF ENLISTMENT

The sacrifice made by the men of the medical profession, the wonderful efficiency of their organization, the loyalty to their duties, their heroism, their courage, and their humanity, stand out as one of the noblest events of the Great War. Much has been spoken and written on this subject, but even at that the debt which the world owes to the doctors of America, for their conduct is not yet fully appreciated, and can never be paid. Military medical service however must and does differ from civil service in many particulars. Those admirable qualities of the physician, which have their root in neighborliness and friendship for the patient and family, in citizenship in a community, in responsibility and regard for one's immediate public, cannot figure in military as they do in civil life. I am not unmindful of the great facts that the work of the physician in service has added immensely to the achievements and the efficiency of medicine, and that in a great majority of cases the men were handled with a skill and a result far greater than could have been their portion in civil life. But in the particular class of cases we are now considering, the friendly interest and kindly sympathy of the family doctor, or the neurologist or psychiatrist at home, would have been specially applicable at a time when it could not be had, and when it might have averted much future suffering. Even where the conditions were most favorable, these propositions were possibly true, but in the many instances where the hurry and urgency of the work necessarily prevailed, they are probably undeniable.

DOMESTIC AND OTHER CONDITIONS, ENCOUNTERED ON RETURNING TO CIVIL LIFE

Here we have one of the most powerful of the acting etiologic factors. For even the strongest character, to make the necessary readjustment to ordinary civilian duties, this period required the fullest assertion of self control and command. To the neurotic, it was a task which could not be accomplished without efficient help. This of course, in many instances, was found in their friends and families, but for a

large number, this was not available. Many returned to find parents dead, or ill, or financially distressed. Wives had gone wrong, sweet-hearts had failed them, strangers were occupying the places into which they had hoped to come.

Every physician is familiar with the devoted vigil of the wife over her seriously sick husband or child, carried beyond all theoretical possible endurance, and of the invariable breakdown on the improvement or recovery of the patient. Some cases have come to my notice, where men have served on the front with immense tension, and without realizing that they were wearing out, up to the very hour of the armistice, with the utmost collapse immediately or soon after.

CHARACTER OF MEDICAL MANAGEMENT SINCE DISCHARGE

There has been much tendency on the part of the discharged soldier suffering with a neurosis, to dawdle and to dally, without seeking medical advice, trusting that a period of rest would restore. With the organization of the examining boards, under the U. S. P. H. S. on which neuro-psychiatrists have been called to serve, many of these cases are receiving competent study, and fair management. There is keenly felt the need of special institutions for this class of patients. They are sent to general hospitals, and in the border line cases to hospitals for the insane, but neither is ideal to the extent that special hospitals would fill the need.

It has not been my object in this paper to classify these cases, nor to study their symptoms, or suggest their treatment. Rather have I aimed to plead for a recognition of fundamental and general causes, so that the need for reconstruction of the mental life of the sufferers may be fully appreciated.¹

¹ Read before Cache Valley County Medical Society March 25, 1921, at Logan, Utah.



SUGGESTIONS FOR THE TREATMENT OF NERVE INJURIES

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THE great number of nerve injuries occurring among the casualties of the past War, has given us a much clearer conception of the clinical manifestations of such lesions, and this experience has resulted in the evolution of definite therapeutic aspirations.

A brief survey of the clinical course of nerve injuries and their regenerative syndrome will help materially in directing our attention to those therapeutic indications which tend primarily to inhibit the degenerative changes occurring in tissues whose function and nutrition is impaired by a nerve lesion. It is obvious that before these therapeutic problems can be properly considered, it will be necessary to appreciate certain pathological factors involved. To successfully apply physiotherapeutics, it is essential to understand not only the clinical manifestations of nerve injuries, but also the function of each muscle entering into or modifying the clinical picture.

When a nerve has been interrupted, there results an abolition of motor function in the muscles governed by that nerve; they waste from lack of use and impaired nutrition; they undergo fibrous transformation; they become stretched, or may develop fibrous contractures. The normal antagonistic muscles having their action modified tend to develop spastic contractures; they develop pernicious habits in the assumption of trick movements by their endeavor to compensate for function lost in the paralyzed muscles. In joints whose function is modified as a result of the paralysis, amplitude of motion becomes more and more restricted, because of fibrous changes occurring in the periarticular structures. These factors must be fully appreciated, for the treatment is fundamentally directed to the prevention of such complicating sequelae. Experience has led us to believe that these changes may be very markedly inhibited by well directed, persistent treatment, but if muscles have been allowed to become extensively indurated and joints fixed by fibrous tissue, their correction becomes, with time, increasingly difficult.

Nerve injuries vary in degree; they may be partial or complete; they may be in the nature of compression, or of complete anatomical division. The anatomical structure of a nerve may remain intact, though its physiological continuity be disturbed—physiological interruption—

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usually due to contusion or compression. In anatomical interruptions the nerve trunk may be partially or completely divided, and when the conducting fibres—the neuraxons—are divided, their distal segments completely degenerate, and the nerve trunk below the lesion consists of empty channels, from which the active conductive element has disappeared by degeneration and absorption. Regeneration consists in the outgrowth of the neuraxon from the point where it was divided, down through the emptied channels of the distal nerve segment to its motor or sensory end-plate. When a nerve has been divided, scar tissue may form between its ends, and the neuraxons of the proximal portion of the nerve trunk may not be able to penetrate through the scar and reach the distal segment. This is often the case in nerve injuries, and before regeneration can proceed, it is necessary, by surgical intervention, to resect the scar from between the nerve-ends and accurately oppose the divided nerve trunk by suture. The downgrowth of the neuraxon through the conducting channels of the old trunk is a very slow process, progressing probably at the rate of 1 to 1½ millimeters per day, so that many months are usually required before the nerve fiber connects up with its motor end-plate in the muscle fibre to which it has been directed. After this neuromuscular junction has been re-established, it is necessary before function can return, that volitional motor impulses be able to travel through the regenerated nerve. These muscle fibres have so long been separated from the central nervous system, that psychological and physical reestablishment presents certain definite problems in re-education: first, in the directing of voluntary impulses through the regenerated nerve; second, the placing of the effort in effecting a definite action; third, in producing muscular coordination and the development of power. Following the paralysis, nature, to compensate for the loss of a given group of muscles, acquires trick or substitution movements, by which a normal group of muscles attempts to assume certain functions which will assist to a greater or lesser degree in the imitation of those movements normally executed by the paralyzed muscles. These substitution movements easily develop into habit complexes, and with the re-education of an extremity after a nerve injury of considerable duration, there is frequently great difficulty in overcoming these substitution movements, which are continued by habit.

When a muscle has been deprived of its nerve supply, it undergoes a series of changes which in relation to its electrical excitability constitutes the reaction of degeneration. The denervated muscle no longer reacts to faradism, and though it is at first hypersensitive to the galvanic current, the degenerative changes in the muscular tissue progress eventu-

ally to a degree in which the muscle has undergone almost complete fibrous transformation—a condition in which it fails to react to any applicable electrical or mechanical stimulation. This is what we might term the complete reaction of degeneration, which means the total absence of those physiological reactions which characterize muscular tissue. While this degeneration and fibrous transformation is taking place in the denervated muscular tissue, a similar transformation is developing in the surrounding tissues; more particularly manifest in the periarticular structures and tendon sheaths, greatly interfering with both active and passive joint function. Frequently, the fibrotic transformation in muscles becomes so extreme as to produce severe contractures with marked deformity; this is especially true in irritative lesions. At other times, the paralyzed muscle undergoing fibrotic degeneration may be greatly stretched by the action of antagonistic muscles and the development of trick movements. The stretching of a muscle which has lost its tone, and to a great extent its elasticity, is productive of disastrous results, in that after complete regeneration of the nerve, the stretched muscle fibres are unable to reassume their primary function of contraction.

The surgical treatment of nerve injuries consists almost entirely of the removal of scar tissue, which interferes with regeneration or the physiological activity of a nerve, but after a nerve is freed from scar tissue or its ends sutured, the course of regeneration has just begun, and the treatment, from this period, falls almost entirely in the domain of physiotherapeutics.

STAGES OF REGENERATION

We may divide the period of nerve regeneration into three definite clinical stages, and a consideration of each stage will suggest the therapeutic procedures to be instituted:

The *first stage* constitutes the period during which the regenerating neuraxon is growing from the point of its division to the muscle, with the reestablishment of its neuromuscular junction.

Second Stage.—The interim after the establishment of this neuromuscular junction (the restitution of the sense of muscle function), until the appearance of voluntary muscular contractions.

Third Stage.—From the first appearance of voluntary motor power, to the period of complete motor restoration.

TREATMENT

The treatment during the *first stage* consists in:

1. Maintaining nutrition through the stimulation of blood and lymph

circulation, and the inhibition of fibrous transformation of muscular tissue.

2. The prevention of muscle stretching or the formation of contractures.

3. The prevention of fibrotic limitation of joint function.

Second Stage.—A continuation of the above treatment with the addition of:

1. Psychological treatment directed to the reestablishment of the power to transmit volitional impulses through the regenerated nerve.

Third Stage.—1. The psychological direction of impulses for definite muscle movements.

2. The development of power in the regenerating muscles.

3. The reestablishment of muscle coordination with the elimination of compensatory habit trick movements.

TREATMENT DURING THE FIRST STAGE

The maintenance of nutrition and the elimination of waste products in tissues which have been deprived of their nerve supply, is markedly favored by massage and thermotherapy. The lymphatic circulation is best stimulated by muscle kneading—petrissage—while light stroking—effleurage—improves the capillary circulation; both should be directed from the periphery to the center. These procedures while maintaining nutrition, tend materially toward the prevention of fibrous induration. Massage should never be used in the presence of an acute infection, as the manipulation of infected tissues tends to disseminate the infecting agent. In old infected wounds or chronic osteomyelitis, however, massage may be used above and below the lesion. Superficial scars which are adherent to underlying structures can usually be liberated by vigorous massage, but should such a procedure be followed by a strong reaction with inflammatory symptoms, it should be immediately discontinued.

Massage, in nerve lesions, should be preceded by thermotherapy and electricity. Moist heat in the form of a whirlpool bath, is perhaps the best means of preparing the limb for electrical treatment and should be continued for five to ten minutes. The hot paraffin bath is of considerable value when used as an adjunct to massage, but is not satisfactory as a preliminary procedure to electrical treatment.

Joint restriction—periarticular fibrotic infiltration—is best prevented by passive and active manipulation of the joint through practically its entire range of motion. Great care must be used, however, in this pro-

cedure, to prevent the overstretching of paralyzed muscles. In the manipulation of joints it is essential that pressure be directed in a manner that will bring the joint surfaces in forcible apposition—this pressure movement tends to prevent the “atrophy of disuse” which takes place in bones and joints subjected to prolonged periods of splinting or inactivity—it resembles the pressure exerted on joints by muscular action. Each joint of an extremity must receive careful attention; its normal range of motion in every direction should be imitated by passive movement. Careful records of the amplitude of joint motion with metrotherapy measurements, should be kept, when possible, and frequent reference to these recorded measurements will reveal any tendency toward the development of contractures. It will also indicate the efficiency of treatment when such is instituted for the correction of joint limitation. In the manipulation of joints, while it is important to prevent undue stretching of the paralyzed muscles, it is essential that the normal muscles be stretched to their limit, which procedure will assist in the prevention of tonic contractures. When there is a limitation of joint function due to fibrous contractures developing in the paralyzed muscles, joint manipulation directed to their stretching is required; this, however, must be done with exceeding care, for overstretching may produce serious damage to ultimate muscle function.

ELECTRICAL TREATMENT

Electrical treatment is directed primarily toward the maintenance of contractility in the muscle fibres. It is well known that the function of a muscle is greatly impaired by non-use, even though its nerve and blood supply are normal. When a muscle has been deprived of its nerve supply, degeneration of its fibres takes place rapidly, and if allowed to continue untreated, progresses to a state of almost complete fibrous transformation. A denervated muscle will not react to faradic stimulation, but galvanism, because of the nature of the current is capable of direct muscle stimulation. The beneficial effect to be derived from electrical treatment depends entirely upon its ability to stimulate muscle contractions, which in turn tends to improve the nutrition of the muscle fibre and to inhibit fibrous transformation. Electrical stimulation does not seem to retard materially the atrophy resulting from nerve injuries, but experience seems to indicate that muscles so treated preserve their contractile elements and do not progress to that state of complete degeneration observed in untreated muscles. The application of electrical treatment should therefore be directed primarily to the induction of muscular contractions in the paralyzed muscles. Individual muscle stimulation should be attempted

in preference to group stimulation, because, in the latter, many individual muscles may be overlooked. It is important that records be kept showing the degree of electrical irritability maintained in each muscle, and frequent references to these records will indicate the results achieved by treatment. The operator should be careful to tabulate not only the degree of the muscle responses elicited, but also the nature of the contraction and the amount of current required to elicit same. The current should be applied in such a way as to prevent its overflow into normal muscles; the stimulation of which will have a tendency to overdevelop healthy antagonists.

It is essential during treatment and at all other times, that the paralyzed muscles be not overstretched; for instance, in a musculospiral lesion when the arm is removed from the splint, the wrist should not be allowed to drop, and, during treatment, the hand and wrist should be securely supported; the overflow of the current, if these precautions are not taken, might produce a marked flexion of the wrist resulting in overstretching of the paralyzed group. The electrical treatment should last sufficiently long to elicit 10 or 15 contractions in each muscle.

A very good routine to follow in the daily treatment, consists first, in the immersion of a paralyzed limb in a hot whirlpool bath for five minutes, followed immediately by the electrical treatment, after which, ten or fifteen minutes of massage for the purpose of eliminating the waste products created by the electrical stimulation and promoting nutrition by improving blood and lymph circulation.

The stretching of a paralyzed muscle is a serious complication, greatly inhibiting the return of voluntary motor function: it is very common in musculospiral and sciatic lesions: an unsupported "wrist-drop" and "foot-drop" may so impair the paralyzed muscles, that even though the nerve has successfully regenerated, the stretched muscles are unable to respond to motor impulses. (Very often, a stretched muscle with intact nerve supply will develop signs of complete degeneration.) Substitution or trick movements are a frequent cause of muscle stretching, as is also the careless use of electrical stimulation, during which if the wrist or foot is not adequately supported, a current overflow in the normal muscles may produce vigorous contractions throwing great strain on those which are paralyzed.

The prevention of muscle stretching is best accomplished by the persistent use of relaxation splinting; the more common type of such splint being the "cock-up" splint for musculospiral paralysis, and the "drop-foot" splint for sciatic paralysis. These splints should be continuously worn, and those adapted to both night and day wear, should always be available.

Tonic contractures frequently develop in the normal muscles of an extremity, when the antagonists are paralyzed, and particularly if splints have been neglected; it is of great importance during manipulative treatment that the normal muscles be stretched to prevent this type of contracture. The most notable examples of tonic contractures are seen in external popliteal lesions, where the gastrocnemius, unopposed, produces constant plantar flexion of the foot, which soon develops into a contracture—"short achilles tendon"—and in turn causes marked stretching of the paralyzed anterior group (dorsal flexors of the foot). Even in complete sciatic lesions, where all muscles below the knee are paralyzed, if splinting does not properly support the foot, fibrous contractures frequently form in the paralyzed gastrocnemius. The early recognition and correction of developing contractures is of utmost importance, and may prevent serious complications, but, if neglected, may ultimately defeat the aims of months of treatment. These possibilities will indicate the importance of making frequent metrotherapy readings for checking the exact status of joint function.

While relaxation splinting of paralyzed muscles is of great importance in the prevention of their stretching, this splinting if not properly controlled, may result in serious joint limitation, which not infrequently becomes more disabling than perhaps the original paralysis. The possibility of periarticular fibrotic limitation in partially immobilized joints, demands that when splints are used for the prevention of muscle stretching, these splints be daily removed, and, under careful supervision, each joint be made to undergo complete passive excursions effecting its full range of motion. Careful attention to these manipulative procedures should almost entirely eliminate serious interference with joint function. The electrical stimulation of individual muscles will tend to prevent the development of the fibrous implication of tendon sheaths, a condition which seriously restricts joint activity and, ultimately, the restoration of muscle function.

TREATMENT DURING THE SECOND STAGE

With the paralysis of muscles following a peripheral nerve injury there results a loss of deep sensation—muscle sense—as well as superficial sensation in the cutaneous distribution of the injured nerve. When muscle sense is lost, the patient is unable to consciously place an effort at muscle function in the paralyzed group—the endeavor to lift the wrist in a musculospiral paralysis is not associated with the sensation of being able to accomplish the specific movement. When, however, the nerve has regenerated to its end-plate in the muscle, deep sensibility is regained, and the presence of the muscles involved again enters con-

sciousness, i.e., the patient experiences the sensation of definite muscle effort—he feels that the wrist should lift by this effort, though such an attempt may not be associated with any visible manifestation of power. This is the psychological restoration of function and may precede voluntary motor action by weeks or months. The second stage begins with this psychological restitution of the muscle and it ends with the return of voluntary power. Frequently, regeneration does not progress beyond the second stage; the patient feels that he has the power to move the paralyzed muscles, but his efforts are not rewarded with success. This disability may be continued because of the following conditions: first, the inability of the individual to force a satisfactory motor impulse through the regenerated nerve to the muscle; secondly, muscles because of continued stretching, are unable to respond when a definite impulse reaches them. These two factors are responsible for much of the retarded restitution of function following nerve injuries.

The treatment during the second stage consists of the continuation of that instituted for the first stage, and, in addition, psychological treatment for the purpose of effecting the passage of volitional impulses through the regenerated nerve. Such treatment is directed to assisting the patient in procuring a successful volitional impulse. This should be possible within two or three months after psychological restitution.

In testing for the first appearance of voluntary function, great care must be used in the elimination of gravity; and frequently the examiner is rewarded by feeling just a slight movement in the muscle tendon. Patients are usually surprised at the discovery of their first successful volitional impulse; the movement is very weak and the effort associated with great fatigue. There may be a lapse of several days before the patient can again reproduce the motion, during which time he feels that he has again forgotten the mechanism of the movement—which means that he has forgotten how to force a motor impulse through the nerve. Some patients are very much longer in regaining this power than others, but we are convinced that with proper assistance in the form of psychological treatment, the second stage may be greatly shortened.

Psychological treatment is best instituted during interrupted galvanic stimulation of the muscle, during which the patient's attention is concentrated on the muscle receiving stimulation. The operator counts, and with each count an impulse is passed through the muscle; also, at each count, the patient makes a vigorous endeavor at volitional contraction of the muscle being stimulated. In this way his kinesthetic sense is being rebuilt; that is, he is learning the sensation produced by the contraction of the individual muscle, and at each count, he is endeavoring to reproduce that sensation. The operator while continuing the

count may, occasionally, omit the passage of the galvanic impulse, though the patient continues to make his effort unassisted by the electrical stimulation, and he is frequently rewarded at this time, with the first manifestation of unassisted voluntary contractions. This treatment should be persisted in daily until it is possible to force impulses through at will, and, with this accomplished in all of the formerly paralyzed muscles, this type of psychological treatment may be discontinued.

TREATMENT DURING THE THIRD STAGE

The treatment during the third stage (after definite voluntary motor power has been restored), consists in psychological treatment somewhat similar to that of the second stage, but differing in this respect, that the patient is here taught to direct impulses for definite coordinated movements. This becomes in reality a question of reeducation, because certain nerve fibres which originally controlled a given muscle or muscles which governed a special function, may now be directed to another group. It is not an unusual experience in brachial plexus lesions, to find that attempts to extend the wrist will result in flexion, or that attempts to flex the arm produce extension. These disturbances of function and defective muscle sense are frequently exceedingly difficult to correct. They are present to a greater or lesser degree in almost every sutured nerve. Treatment consists in working out or untangling the muscle complex, and demonstrating to the patient the effort required to accomplish a given movement. Efforts of this kind at first require a definite psychological direction, but, with practice, become habitual. This reeducation is analogous to that required following tendon transplantation. Occasionally, however, the arrangement is not so favorable and reeducation may become exceedingly difficult. While the patient is learning to make a corrected movement, his whole attention should be concentrated on this effort, first to execute the movement satisfactorily, and to familiarize himself with the sensation experienced in reproducing that movement—the reeducation of the kinesthetic sense. Movements at first should be slowly and carefully executed, later increasing in rapidity.

Splinting for the relaxation of weak or paralyzed muscles must not be discontinued until muscle strength has developed sufficiently to hold the extremity in its normal position. When a splint has been removed before muscles have completely regained their power, the limb should be carefully watched and any manifestations of returning "wrist" or "foot-drop," etc., should immediately cause the reapplication of relaxation splints, it always being borne in mind that a muscle will not

gain power so long as it is being overstretched; in fact, overstretched muscles will frequently lose the power they have gained. It should always be the aim of the operator in reeducating muscles or in increasing their strength, to at first endeavor to restore range of motion, rather than strength, and this is best accomplished with the elimination of gravity. After the full amplitude of muscular action has been attained by *assistive* exercises, attention should be directed to *resistive* exercises for the development of strength.

The reestablishment of muscle coordination with the elimination of compensatory habit movements, is both important and difficult. These habit trick movements frequently persist long after the paralyzed muscles have regained power, and their presence greatly disturbs the functional coordination of the extremity. It is very common to see a regenerated musculospiral case, which is unable to extend the wrist effectively, because the flexors of the wrist persistently contract simultaneously with the extensors; this is the result of a substitution movement, now a habit, which the patient early developed in producing extension of the fingers. It is also very common to find that attempts at extending the thumb result in marked contractions in the muscles of the thenar eminence, which is also the remains of a trick movement. Often the correction of such obstacles to muscle coordination will tax the operator's ingenuity, and each case requires a definite study of individual muscle function before a successful outline of reeducational treatment can be given, but for the ultimate re-establishment of a useful coordinating extremity, these conditions must not only be recognized but anticipated, and throughout the entire course of treatment these factors must be ever in mind, and attention directed as much to their prevention as to their cure.

The surgical treatment of nerve injuries presents many factors of extreme importance in questions of technique, and an error in judgment or a slip in technique may be responsible for more or less unsatisfactory terminal results, in so far as ultimate function is concerned. Yet the after care is of such importance that a failure to early recognize and correct these complications, which seem to be more or less inherent to all nerve injuries, may completely defeat the aim of treatment and annul the results of the most brilliant operative procedure.



VINCENT'S ANGINA

BY 1ST LIEUTENANT DUMONT F. ELMENDORF

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AT the recent symposium on the subject of "Vincent's angina" held by the medical and dental officers of the American Forces in Germany, a rather comprehensive presentation was made concerning the bacteriology, symptomatology, diagnosis, prognosis and treatment of this disease, but the mode of transmission and the question of so-called "carriers" was touched upon very lightly. This after all, is of foremost importance to the medical officer who must always be mindful of the prevention of disease.

It would be well therefore to consider the three questions which follow before closing the discussion:

(a) *Are there carriers in the same sense that we recognise in the case of Klebs-Loeffler bacillus?*

(b) *Should all carriers be isolated? That is, if there are carriers, is the disease of a serious enough nature to warrant complete isolation until dark field examinations are negative?*

(c) *What should be done to render carriers negative and what sanitary precautions can be resorted to by the regimental surgeon to combat the spread of this infection?*

(a) It has been my belief that this organism has a far wider distribution through the command than mere occurrence of the reported cases in the Station Hospital would indicate. The statement made at the recent symposium by Lieutenant Gill, M. C., that "Occasionally the organisms were found in apparently healthy mouths" might be amended to read "Generally found in mouths with very slight and unrecognized pathology" and the statement of an authority referred to by Captain Gray, D. C., that the mouth without these two organisms was a rare occurrence, should be given very great importance not only as expressing an axiom but as indicating the scope of the subject with which we are dealing.

Forty men were examined at the Convalescent Hospital without regard to past history of gum or throat trouble and the results were:

FORTY DARK FIELD EXAMINATIONS OF GUMS

34 positive for spirochete and fusiform bacillus	85 per cent
6 negative	15 per cent

All cases were then examined by Capt. Dell S. Gray, D. C. Out of

thirty-four cases with positive dark fields, twenty-four cases or 60 per cent had definite destruction on the gingival margin, seven cases had marked destruction of gum substance while seventeen showed either very slight pathology or moderately advanced changes.

The six cases with negative dark fields were also examined and four, or 66 $\frac{2}{3}$ per cent, showed no lesions in the gums whatever while two had slight evidence of destruction: one of these cases is a tobacco chewer.

Since only 60 per cent of the men examined had any evidence of gum pathology and only 17 $\frac{1}{2}$ per cent showed well marked pathology and since 85 per cent of the cases examined had positive dark fields, it is clear that the organisms in question are present in mouths which may be considered normal. Of the forty cases examined 10 (25 per cent) were passed as normal by Captain Gray which had definite positive dark fields. It is the belief of the writer that these cases would presently show greater gum pathology if active treatment were not started at once. These ten cases, however, may be considered carriers in the true sense, as they harbor organisms capable of causing disease but do not suffer from the disease themselves.

It is further believed that all cases of Vincent's angina proper (tonsillar infections) are secondary to this wide spread gum infection. Four of this series of cases or 10 per cent have been treated for true Vincent's angina.

An additional item of interest is the following: Out of the forty cases examined five have had courses of anti-syphilitic treatment, one having completed one course, two having completed two courses and two having completed three courses. All these men had positive dark fields for the characteristic organisms of Vincent's infection of the gums. From this it would appear that the silbersalvarsan treatment cannot be recommended for the cure of gum infection by these organisms. The argument might be advanced that these cases have been cured of Vincent's infection of the gums by their courses of anti-syphilitic treatment but subsequently became reinfected. This, although possible, is highly improbable as they constitute the group of cases showing well advanced gum pathology and many cases of gum infection receiving a course of local treatment to be described later have not become reinfected.

Last winter a similar condition was reported by Capt. W. C. Pollock, then Surgeon of the Engineer Battalion and it is my belief that these two organizations are not the only ones in which this condition exists but that should a canvass be made and dark fields be taken of a representative group from each organization in the A. F. G., it would be seen that the distribution of these two organisms is very universal.

(b) Should carriers be isolated? I am of the opinion that the

condition is too wide spread and the gravity of the disease not alarming enough to warrant complete isolation of all cases of carriers. From a standpoint of public health we are dealing here with a condition similar to the presence of the pneumococcus which has been found in as many as 90 per cent of apparently healthy mouths.

It is self-apparent that cases of active disease with outspoken tonsillitis and fever should not only be hospitalized but isolated, as here the organism has proven itself to have high virulence, as is the case with pneumonia. But to isolate every case where the organism is found by dark field examination would be a great hardship to the individual and the command. The seriousness of the disease does not warrant it and more satisfactory measures can be taken by the medical and dental officers, acting in conjunction, to combat the spread of this infection.

(c) In every case of Vincent's infection of the tonsil the gingival membrane should be regarded as the starting point of the infection. If dark field examinations or stained smears are made the infection will be found in the majority of cases. Every case of true Vincent's angina before being discharged should have an examination by a dental officer and active treatment started to eradicate the infection from the gums. So long as the gums harbor the infection relapses are nearly certain to occur on the tonsil.

It is also very important to recognize these cases at the start as the treatment for follicular tonsillitis generally prescribed (such as gargles of Dobell's solution and swabs with argyrol or silver nitrate in 5 per cent or 10 per cent strength) in my experience has not had any beneficial effect.

Every case in which a smear or dark field examination of material from the gums is reported as positive should be sent to a dental officer for active treatment, regardless of whether the patient has ever had any symptoms referable to the tonsil or gums. The treatment which has been found most effective at this hospital is as follows:

Cases of Vincent's tonsilitis are isolated in bed. The treatment is started by giving a saline cathartic; sodium salicylate is administered 4 times daily; the ulcer is swabbed out twice daily with 5 per cent chromic acid; the patient is required to gargle every half hour with full strength hydrogen peroxide so long as temperature and pain are present and less often as the symptoms subside. Great care should be taken to introduce the swab (a wood applicator wound with cotton) to the full depth of the ulcer.

The majority of cases are free of fever in 48 hours and have no severe symptoms after four days. In a few cases it may be necessary to substitute for the 5 per cent chromic acid a paste made of potassium per-

manganate crystals and water. The organisms appear to be very susceptible to the action of hydrogen peroxide, which should constitute a part of the local treatment in any case.

In order to eradicate the infection from the gums, dental treatment is imperative. The teeth are cleansed of all traces of tartar and calcareous deposits. The ulcerating surfaces on the gums are cleansed by applying hydrogen peroxide with cotton swabs and all loose tissue is removed. To the ulcers which have been so cleansed a solution of 5 per cent chromic acid is applied. This is washed off with water in about ten minutes to prevent discoloration and destruction of the enamel. The application is made once every other day; on the alternate days a paste of potassium permanganate and water should be substituted.

The mouth is washed every half hour during the acute stage with hydrogen peroxide and the teeth are cleansed after each meal with a tooth brush soaked in pure peroxide. A spray of compound tincture of benzoin may be used after treatment to relieve pain.

Careful sterilization of all mess kits and cooking utensils should be carried out after each meal. This should be done purely as a precautionary measure and should not be considered as a method of eradicating the infection. There are numerous ways common to soldiers of bringing about a trade in saliva, such as smoking a cigarette lighted by another man, using another's pipe, the ordinary droplet infection and promiscuous spitting. These and many others are capable of spreading such an infection as this, which is commonly termed "trench mouth," but it is very important during the washing of mess kits not to spread the infection from the utensils of one man to those of another by way of lukewarm wash water.

It has been the practice at the Convalescent Hospital to insist upon sterilization of all mess kits. This is accomplished by a series of three French kettles. The first two are filled with a strong solution of laundry soap kept at the boiling point at mess hour. The third kettle is filled with clear boiling water. These kettles are placed in line so that it is necessary for each soldier after emptying his refuse in a galvanized iron can to pass by each of these kettles before emerging from the line.

Bacteriological tests have been made by taking samples of the water during the time mess kits are being washed and swab cultures have been made from meat cans, cups, knives, forks and spoons, and inoculated immediately into bouillon. The tests have proven the system efficient and it is strongly recommended for general use in the Army.

Lastly, lectures should be given to enlisted men by a medical or dental officer. These lectures should describe the usual symptoms of "trench mouth," the effect upon the gums and teeth if left untreated,

the danger of a complicating tonsilitis. In addition, they should point out how infection can be transmitted from the man to another by a trade in saliva.

Great interest in the subject has been stimulated at this hospital throughout the medical detachment and the results have been very gratifying and will be embodied in a later report.



A MODEL SANITARY ORDER

By CHARLES W. DECKER, M.D.

Formerly Colonel Medical Corps, U. S. Army

IT is hoped that this article will elicit an interesting discussion by those whose seniority and responsibility in the recent war made the drafting of orders for camp and cantonment sanitary service one of their many duties. The junior officer who will perform these duties in the next war may find instruction in the problems that confronted his predecessors.

Much enters into sanitary administration that can not be written into the law. In civil life, we frequently attribute success of a man in the business world to individuality or the personal equation. In the military establishment it is of greater moment even that between the medical officer who formulates sanitary instruction and the commanding general in whose name it is promulgated as an order, there exist mutual understanding and respect. One of the finest sentiments expressed during the war was by a major general, meeting for the first time the assembled members of his staff. He began by stating that he assumed that each member was a specialist in the particular field assigned him by the War Department. He required not only loyal support and cooperation, but wanted each officer to exercise to the fullest extent the special knowledge which he possessed. Only by the combined efforts of all, coordinated by the commanding officer, would it be possible to accomplish the great tasks before them in training and preparing the division for war. With this kind of commanding officer, it is not difficult to frame an order that makes administration of sanitary service a definite and positive force in the life of the command. To the experienced medical officer, the establishment of such a complete understanding between himself and his general, appeals as the most important element in the sanitary tactical situation. This cannot be accomplished by a smiling acquiescence in every idea advanced by the "Old Man." Knowledge of scientific medicine, in its application to disease prevention, must be presented clearly and sometimes firmly, but always courteously. Very, very rarely will such advice be disregarded.

Before compiling the several sections of the sanitary order many things outside of the Manual and Field Service Regulations should be considered. A thorough knowledge of the local water and soil conditions is necessary. A call upon local and State health officers will give data regarding health conditions in general, and communicative disease in particular. The State quarantine laws must be understood, since

wide differences exist. While some States have helpful laws that can be used to advantage, others have none. One must acquaint himself with conditions in the State or area from which recruits will be drawn. After a complete survey of the camp area to determine its advantages for drainage, sewage disposal, and possibilities for removal of garbage and manure, you are ready to begin a rough draft of the sanitary order.

Perhaps the next war will witness the same hastily constructed camps, with their thousands of laborers ignorant and careless of all sanitary requirements. These present a problem to be considered, as for a number of months they will mingle with the soldiers and recruits in the busy camp. Contractors and construction engineers are often resentful of restrictions put upon them by the newly arrived medical officer, and any early and cordial acquaintance established with the responsible heads of the construction forces will lighten your burdens. By tact and diplomacy cooperation must be obtained, if you would not destroy the effectiveness of your sanitary instructions to the daily arriving recruits. Bad example and precept are more easily adopted than correct measures by these young men not yet schooled as soldiers. His privilege to pollute the soil, and a belief that water is water, to be drunk wherever found, are prized possessions of most Americans. Strive as you may, these two problems will be with you always.

Some comments and observations can better follow a reading of the sanitary order itself. Each paragraph recalls to its author many experiences that have influenced its construction.

WAR DEPARTMENT HEADQUARTERS CAMP DASH

GENERAL ORDERS NO. 5

July 4, 192-?

Sanitary Administration of this camp includes Base Hospital No. 100, and Auxiliary Remount Station No. X on Sandy Slope Hills.

The following sanitary regulations are published for the guidance of all concerned:

1. **RESPONSIBILITY FOR SANITATION.**—Commanders of all grades are responsible for police and sanitation and for the enforcement of the provisions of these regulations within their organizations.

2. **CAMP SURGEON.**—The Camp Surgeon is charged, under the Commanding General, with the general conduct and supervision of the Medical Department of the Camp in the performance of its duties and will make recommendation concerning all matters pertaining to the sanitary welfare of the command. He is responsible, not only for the special training of the medical personnel, but for instruction of the entire command in personal hygiene and sanitation.

3. **SANITARY INSPECTOR.**—The Camp Sanitary Inspector is assistant to the Camp Surgeon and is charged with the supervision of sanitation of the command. Organization commanders will remedy defects reported to them by him, with the least possible delay.

4. **SANITARY SQUADS.**—Will be organized by the Camp Surgeon for special

sanitary purposes such as the purification of water supplies, mosquito and fly prevention, disposal of wastes, and disinfection. They will consist of officers, non-commissioned officers and privates first-class or privates of the Medical Department, assisted by civilian sanitary laborers employed by the Quartermaster Corps, and if absolutely necessary, by details of officers and enlisted men from other branches of the service.

In the performance of duty, the Camp Surgeon, Camp Sanitary Inspector and sanitary personnel will have access to all parts of the camp. Commanders will accord them every assistance in their work.

5. **WATER SUPPLY.**—This camp receives water from the general supply system of the City of Blank. Frequent bacteriological examination assures that it is a safe water. Securely covered water containers with faucets will be provided, and placed on stands three feet high. Common drinking cups must not be used.

Long-continued soil pollution renders all SPRING and SURFACE water in this vicinity UNSAFE for drinking purposes.

6. **KITCHEN AND MESS HALLS.**—Kitchens and mess halls will be securely screened and fly traps provided for catching flies that gain entrance. Fly paper may also be used. All food receptacles, dishes and tableware will be protected from flies and dust by cloths with weighted edges. Unit commanders will see that an ample supply of boiling water and clean dish towels are provided for properly cleaning cooking utensils, dishes and mess kits. Ice boxes will be kept elevated at a height sufficient to allow inspection and cleaning. Drip pans under ice boxes will be emptied and scalded daily; they will not be allowed to overflow. (Note: Torn flour sacks from the camp bakery make excellent dish towels.)

7. **PUBLIC BUILDINGS.**—Exchanges, restaurants, amusement halls, theaters, clubs, or other places of congregation within this camp are under the control of the Commanding General and will strictly observe the provisions of this order. The Sanitary Inspector will make frequent inspection of such places and give instruction directly to those in charge for correction of any sanitary defects noted. All buildings erected for such purposes here must embody sanitary, ventilation and safety features approved by the Camp Surgeon.

8. **FOOD AND DRINKS.**—Manufacturers of, or dealers handling, manufactured foods or beverages for consumption in Camp Dash will file with the Camp Surgeon the guarantee specified in Section (c), Regulations 9, Pure Food and Drug Act, June 30, 1906, as amended; and in addition thereto, as the Camp Surgeon may require, a report by some public health officer or food inspector regarding the cleanliness of their establishment.

Growers of, and dealers handling, fresh fruits and vegetables must satisfy the Camp Surgeon of their ability to deliver such products in a fresh, wholesome condition.

Milk or cream of a grade less than "Grade 'A' MILK Pasteurized" will not be sold in this command. Ice cream or frozen milk products manufactured from pasteurized products of a plant scoring not less than 90 points under rating of the Dairy Division of the U. S. Department of Agriculture, only can be sold in this camp.

Government inspected meat only will be sold. Representatives of the U. S. Bureau of Animal Industry or Inspectors of the Camp Surgeon will make such additional inspection of meats as may be considered necessary.

A report from some public health department is required regarding the cleanliness of any fish market whose products will be disposed of here. In addition, the market

or dealer will specify in writing, to the Camp Surgeon, arrangements that he makes for packing and icing fish or other sea foods for delivery at Camp Dash.

No food or like commodities will be sold in camp except in the authorized exchanges. The supply of an adequate amount of pastries with the mess should be a well-considered part of the duties of each company mess officer. When this is realized, sale of pastries will no longer be desirable.

ALL EXCHANGES WILL CLOSE FOR ONE HOUR BEFORE EACH MEAL.

Bills of fare should be prepared in advance and adhered to as far as practicable. Food will not be carried to quarters or tents and eaten there.

Attention is called to the use of the following foods the elimination of which from the messes will serve to prevent a variety of intestinal disorders.

(a) Canned milk and fish opened the day before. (Milk and Fish Poisoning.)

(b) Hashes of meats and potatoes prepared the night previous. (Ptomaine poisoning of severe types.)

(c) In certain localities green vegetables, uncooked. (Dysenteries and diarrhoea.)

(d) Restaurants, soft drink booths, questionable theaters, and other catch penny establishments that frequently fringe cantonments contribute nothing to the welfare of the soldier. If properly run, profits that belong to the company fund, go to outsiders. Too often they serve only to exploit the soldier. Always they place an excessive burden upon the sanitary and police service of the command. No such establishments will be allowed within a three mile zone about this camp. This zone will be increased when necessary to safeguard the command.

(9) **BATH AND LAVATORIES.**—Careful inspection will be made daily to see that waste water is disposed of to prevent mosquito breeding and other nuisances. The water supply for camp is based upon normal consumption. Everyone will assist in preventing waste.

10. **DISPOSAL OF GARBAGE.**—Great care should be observed to prevent food waste. Solid garbage will be put in cans tightly covered, and placed on open stands one foot high. The Quartermaster Department has, by contract with civilians, arranged for daily removal by auto truck of all solid garbage in cans.

Company Commanders will at once inform the Camp Sanitary Inspector of any neglect in service, that correction may be made. Liquid waste, dish water, will be carefully screened to prevent solid substances from entering the sewer; until the same is completed, evaporation will be continued.

11. **CARE OF PICKET LINES AND DISPOSAL OF MANURE.**—Picket lines will be kept broom swept, and all manure and straw hauled away daily and burned, or otherwise disposed of as directed by the Sanitary Inspector. A twice weekly incineration of the picket lines will be accomplished with the use of crude oil. Crude oil may be obtained from the Camp Quartermaster on usual requisition.

12. **DISPOSAL OF EXCRETA.**—Havard Boxes, over pit latrines ten feet deep and three feet wide, must be used until the sewer system is put into operation. Constant care by company officers and the sanitary inspectors must be exercised to make them effective. Latrine box seats will be scrubbed daily with soap and water. Once weekly, on Saturday, and at other times requested by the Sanitary Officer, a 1:500 cresol solution will be used to scrub the box seats. Pits will be sprayed with crude oil and bone black mixture daily. When pits are sufficiently filled, the Sanitary Inspector will order oiled sacking to cover the pit and extending 18" beyond, and earth added, to entirely fill the excavation, the site being plainly marked "Old Latrine Pit." In case of any pit becoming filled with shallow ground water, prompt report will be made to the Sanitary Inspector for his attention. It will then be pumped out.

Urinal troughs will be painted daily on the inside with a mixture of bone black, 1 lb. to 3 gallons of crude oil.

The interior of the Harvard box will be painted once weekly by the Sanitary Squad with this mixture, care being taken not to soil the outside or the top of the boxes. They will keep all boxes in good repair and ventilator or other openings so screened as to be fly tight.

Urinal cans will be placed in each company street at night and marked with a light. Cans will be removed before reveille roll call, emptied, burned out with straw and crude oil, and the inside painted with crude oil and bone black mixture. Company commanders will be responsible for performance of this service by their men.

One rear seat next to the urinal trough will be marked "G. U. Venereals Only," and must be used by those suffering from any venereal disease. Failure to obey this injunction will subject the offender to arrest and trial for disobedience of orders. Rubbish will not be thrown into latrines.

Facilities for washing hands should, if possible, be provided near each latrine. An ample supply of toilet paper, so secured that it will not be scattered and wasted, will be kept in all toilets.

Ground pollution with human excreta is prohibited, and ALL OFFICERS are charged with the enforcement of this provision.

All toilets in troop trains will be locked when incoming trains leave Blank City and on outward bound trains until they reach Blank City, to prevent ground pollution in that vicinity and along the railroad in Camp Dash. The Military Police will enforce this provision.

13. DISPOSAL OF RUBBISH.—Rubbish not disposed of by incineration in camp will be hauled to authorized dumping grounds. Tin cans will be cleaned thoroughly and strung together, for disposition by the Reclamation Officer. Old bottles, condemned kitchen utensils, etc., may be hauled to these dumps, but it is important that no stale bread, melon rinds, stale meat or things of this nature be permitted to go there.

Military Police and other guards will prevent hauling of rubbish to points outside of camp, or dumping at other than authorized locations within camp. Violations will be reported, naming organization and giving truck or wagon number.

14. PERSONAL CLEANLINESS.—Every member of this command will bathe at least weekly. Commanding Officers will arrange a bathing schedule that their men may share alike the bathing privileges. Army Regulations (Par. 86) require that the men shall wash their hands before each meal and immediately after visiting the latrines. Teeth will be cleaned with a brush at least once a day. Underwear should be frequently changed. Bedding and clothing will be sunned and tents furred at least twice weekly, weather permitting, or more often in emergency, when directed by the Camp Surgeon. In fair weather, all tent crows will remain furred, and all tent flaps will be tied back at night.

15. VENEREAL DISEASE.—The cause of these diseases is a matter of common knowledge. They are entirely preventable and the Government punishes those who expose themselves and contract venereal disease, by prompt stoppage of pay and restriction of privileges while under treatment.

Commanding officers will require that men who expose themselves to the danger of contracting venereal disease shall at once, upon their return to camp or garrison, report to the hospital or dispensary for the application of such cleansing and prophylactic treatment as may be prescribed by the Surgeon General. Any soldier who

fails to comply with these instructions, if found to be suffering from venereal infection, shall be brought to trial by courtmartial for neglect of duty.

Cases of these diseases will be promptly subjected to treatment, but not necessarily excused from duty, unless, in the opinion of the Surgeon, it is deemed desirable. They will be made of record in the medical reports in any case. A list of these diseased, but doing duty, will be kept both by the Company or Detachment Commander and the Surgeon, and the infected men will be required to report to a Medical Officer for systematic treatment until cured. While in the infectious stages the men should be confined strictly to the limits of the Post. When the venereal stockade is completed at the Base Hospital, all infectious venereals will be transferred there for treatment and supervision. When a venereal disease case, whether or not on sick report, is transferred to another command, the Surgeon will send a transfer slip giving a brief history of the case.

Surgeons will endeavor to ascertain source of infection (name, street number and town of prostitute or woman responsible), reporting such information promptly to the Sanitary Inspector.

The Camp Surgeon will advise these headquarters whenever venereal infections reported from a community indicate that it is a menace to the health of the command, that soldiers may be forbidden entrance to such town or community until conditions are corrected by apprehension of lewd women, and satisfactory provision made to prevent them resuming in the place their immoral practice.

16. FITTING OF SHOES AND CARE OF THE FEET.—Attention is directed to paragraph 91, Compilation of General Orders, Series 1917, the provisions of which Company Commanders will follow.

17. PHYSICAL INSPECTION OF TROOPS.—Commanding Officers will require a Medical Officer, ACCOMPANIED BY THE COMPANY OR DETACHMENT COMMANDER, to make a thorough physical inspection twice in each month of all the enlisted men of each organization belonging to or attached to the command. These inspections will be made at times not known beforehand to the men and preferably immediately after a formation.

At these inspections an examination of feet, footwear, the personal cleanliness of the men, and observation for detection of venereal diseases will be made. Written report of findings will at once be made to the Camp Surgeon, using the **WEEKLY VENEREAL REPORT BLANK**, marking it across top, "Bi-Monthly Physical Examination Report."

Report of the second monthly examination will be in the office of the Camp Surgeon on or before the 28th of each month.

18. SANITARY INSPECTION OF ORGANIZATION DAILY.—(a) Surgeons of organizations will inspect daily the commands to which they are assigned, giving particular attention to picket lines, latrines, kitchens, and mess halls, toilets, baths, lavatories, laundries, exchanges, garbage receptacles, incinerators and all food supplies. They will give instructions on the spot to immediate Commanding Officers concerned, for correction of any defects noted. Surgeons will make a brief type-written report in duplicate of defects noted, stating date organization, and numbering defects serially. The original of the report will be delivered by 12.00 noon to the office of the Camp Surgeon, the carbon copy to the office of the Commanding Officer of the regiment or similar unit inspected.

Unit Commanders will have each Company Commander initial the part concerning his company after he has had the defect corrected. If not within his power to correct, the Company Commander will so state. This initialed copy will be

taken up by the Surgeon the succeeding day and delivered with his daily report to the office of the Camp Surgeon.

Neglect or failure of any officer to comply with sanitary instructions will be noted by the Surgeons at their next daily inspection and reported in writing direct to the Camp Surgeon.

Company Commanders will make a daily inspection of their organizations, and Battalion Commanders will inspect at least twice weekly. At this time they will note, especially the policing of quarters, conditions in and about kitchens and mess halls, cleanliness of cooking and messing utensils, showers, latrines, and general police of camp area. Camp area will include surroundings for 200 yards about ground occupied or used for drill purposes. Occupants of trenches, shelter, gunpits or other training areas will always police them before leaving. Conscientious performance of this duty by line officers quickly instructs the entire command in the preservation of its health.

Each mess will be inspected by a Company Officer, to note quantity and quality of the food served and the manner of its service. Deficiencies will be reported to Company Commanders, who will be responsible for their prompt remedy. Once daily a Medical Officer assigned to the unit will assist in this inspection. Neglect or delay will be reported by him to the Senior Medical Officer of the command concerned. Especial attention will be given to economy and efficiency in handling the ration, the garbage can contents usually being a gauge in this matter.

19. **MOSQUITO BREEDING.**—Areas about camp in which mosquitoes might breed, such as cisterns, tanks, gutters, pools and drains, will be kept under close observation by the responsible medical officer and proper remedies applied, i. e., screening, draining, oiling, etc. Weeds and brush will be cut and kept down in the camp area.

20. **FLIES.**—All possible breeding places of flies should be destroyed, particular attention being given to manure and refuse from the picket lines and stables.

An energetic campaign must be begun at once against mature flies, and a large number of fly swatters utilized as well as traps. Traps of an approved pattern and swatters can be obtained by requisition upon the Camp Quartermaster.

21. **IN ALL ROUTINE MATTERS** Pertaining to sanitation in the command, the instructions of the Camp Surgeon and Camp Sanitary Inspector, will be considered the orders of the Commanding General and complied with as such.

BY COMMAND OF MAJOR GENERAL BLACK.

John Brown,
Colonel, U. S.,
Chief of Staff.

OFFICIAL

James White,
Major, U. S.,
Adjutant.

Originality is not claimed for a large part of this order. Personality may rightfully be considered to enter into many of its features, however. These have been the growth of some years' experience and have proven helpful in dealing with sanitary problems.

Throughout this order the idea of fixed responsibility and concentration of authority has been evident. Paragraph one notifies commanders of all grades that responsibility is theirs within their organization. The

closing paragraph clothes the Surgeon and Sanitary Inspector with authority that enables them to get results. With this authority goes great responsibility for its proper use. All that makes up the balance of the order is detail, necessary for education and guidance of the command. Paragraph 17 embodies features that expedite accomplishment in correction of defects. Its proven efficiency should be sufficient answer to criticism these provisions sometimes receive.

This sanitary order may be criticised because of its length. It would be as logical to criticise the length of the Infantry Drill Regulations. The Sanitary order is issued once for all. Its provisions are general and continue in force for a considerable period of time. It will serve for constant reference by the line and medical officer alike. It may be noted that detailed information regarding detection of disease or the manner of its eradication have not been included in the Sanitary order. This is not the proper place for such instructions. From time to time there should be issued from the Camp Surgeon's office bulletins upon strictly medical subjects.

If others have, with different conditions confronting them, viewed these problems from a different point of vantage, their experience, when recorded, will contribute to the sum total of that knowledge we all dedicate to the good of our country, in whose army we serve.



THE ETIOLOGY OF INFLUENZA

By MILTON W. HALL

Major Medical Corps, U. S. Army

AS was remarked in a recent editorial in the *Journal of the American Medical Association*, readers "scarcely need to be reminded that the possible etiological significance of the Pfeifer microorganism, *Bacillus Influenzae*, is still under debate." (1) It may, therefore, prove profitable to review briefly some of the recent contributions to the study of the etiology of influenza, and without attempting to mention every contributor, to attempt to evaluate the various studies and if possible to harmonize the seemingly opposing views advanced. Certain observations made in connection with the writer's study of the lesions produced by filtrates of influenza sputum, while very incomplete, suggest the possibility of this being done. (2)

The doubt as to the active rôle in initiating epidemic influenza played by the Pfeifer Bacillus is of some standing. Pfeifer himself, as well as many others, failed to produce in animals any disease comparable to human influenza by means of his bacillus. Organisms morphologically and culturally indistinguishable from *B. pfeiferi* are known to exist in the respiratory tracts of patients with minor infections, not influenza, as well as in persons apparently entirely well. Some statistics have shown as high a proportion of *B. pfeiferi* in the throats of persons free from the disease as has been the case in various series of cases studied during the recent pandemic. In other words, the organism appears to be one that we have always with us, and if it be the cause of epidemic influenza, a fresh strain of unusual virulence must be responsible for the outbreaks. This appears negatived by the observation that strains isolated during the pandemic, even from closely related cases, are not always serologically identical. (3) and (4) The failure of many competent bacteriologists here and abroad to isolate the Pfeifer bacillus from more than a small percentage of cases studied during the pandemic cannot always be attributed to errors of technique. Admittedly difficult to grow, we have to accept the statements of many investigators that the organism did not occur as a predominating factor in many large series of cases. In reports from different localities different bacteria were shown to have dominated the local bacteriological picture, and judging from this evidence any one of these species of bacteria has as good a claim to the distinction of causing influenza as has the bacillus of Pfeifer.

This variance in the bacterial flora found in patients dead of influenza

is naturally accompanied by a corresponding diversity in the anatomical findings, both gross and microscopic, characterizing the lungs post-mortem. Consequently descriptions of the pathology reported from different localities vary widely. The clinical course of the disease, however, especially during the height of a pandemic, is very uniform, and no doubt can exist as to its essential unity however widely accounts of its etiology and pathology may differ. The points in which differing accounts agree—the common factors in etiology and pathology—are therefore the points to which we should look for recognition of the common disease.

In the pathology these common factors are those findings which are recorded in all descriptions of the disease wherever found, irrespective of the bacteriology, and especially those in fulminant cases dying so early that secondary infection can hardly have been important in causing the changes found. These have been summarized in the article already referred to (2) as “an injury to the capillary walls resulting in congestion and hemorrhage, frequently interstitial, with obliteration or compression of some alveoli and emphysematous dilatation of others, leading in severe cases to intraalveolar exudation of blood or serum, with little if any reaction on the part of the polymorphonuclear leukocytes and with a tendency to healing by organization. There is described a characteristic hyaline membrane coating the walls of the alveoli in the neighborhood of the hemorrhagic lesions and in some cases completely filling the alveoli.” In addition to these findings the usual case of influenza shows post-mortem a purulent bronchitis, peribronchitis or bronchopneumonia whose type varies somewhat with the organism found on culture. The inference seems justified that the changes found in practically all the cases are those of the primary disease and that the varying types of purulent inflammation are the result of secondary invasion.

As already stated, there appears to be no common factor in the bacteriology of the disease as reported by different investigators, whether studied during life or post-mortem. If this fact be accepted in connection with the conception of the essential unity of the disease, it renders probable the existence of some hitherto unknown infective agent as the cause of the primary disease. The work of Nicolle and Labailly, (5) Bradford, Bashford and Wilson, (6) Gibson, Bowman and Connor, (7) and von Angerer, (8) in Europe and Olitsky and Gates, (9) and the writer in this country, all of whom have been able to produce lesions in animals comparable to those described as characterizing influenza by means of filtrates of influenzal material, bacteriologically sterile, points to the possibility of a filterable organism being the primary cause of the disease.

It must be admitted, however, that in the great majority of their experiments these investigators failed to produce in their animals clinical symptoms corresponding to those of influenza, although the anatomical findings correspond very well. Olitsky and Gates produced characteristic lesions corresponding to those of the other workers named, and clinically, fever, indisposition, conjunctivitis, and leukopenia, though none of their animals died unless secondary infection occurred. They used the intratracheal route of inoculation. The writer, injecting his material intravenously or subcutaneously, was able to obtain the same pulmonary localization of lesions and occasionally caused the death of animals in from thirty to forty hours, without any evidence of bacterial invasion. In animals whose lesions were secondarily invaded by bacteria, either accidentally or purposely, Olitsky and Gates found lesions corresponding very accurately with the findings of the influenza lung post-mortem, the suppurative inflammation superimposed on the hemorrhagic lesions produced by the filterable agent. These animals were more acutely ill than those without secondary infection, and usually died. Sublethal doses of bacteria injected into the circulation of an animal already injected intratracheally with the filterable agent produced localization of the bacterial infection in the lungs and usually fatal results. The writer has made a similar observation.

Reports of two investigations have appeared in the last year in which intratracheal injections of bacteria have produced in animals both symptoms and anatomical findings comparable to human influenza. These are the reports of E. C. Rosenow (10) on his work with "green-producing streptococci," and of Blake and Ceil on results with *B. pfeiferi*. (11) The pulmonary changes described in the two reports are essentially similar and substantially conform to those found in the human case at autopsy. The fact that such similar results were obtained by the inoculation of such widely differing organisms is very difficult to explain, on the ground that either is the essential cause of influenza. Moreover, the results in both series of experiments, both clinical and anatomical, appear to correspond very closely not only with each other, but with the results obtained by Olitsky and Gates when secondary infection was superimposed upon the effects of the filterable agent with which they were dealing.

Reasoning from the data given, it appears difficult to come to an opinion as to the etiological value of the various organisms worked with or even to accept as true the work of one group of investigators of influenza without discrediting that of the others. A possible explanation is in sight, however, if we assume that a filterable organism be active in the disease which, while unrecognizable by ordinary methods and

apparently failing to grow on the usual culture media, does grow symbiotically with certain of the known bacteria, causing little or no change in the appearance of their colonies.

Rosenow observed that his streptococci when recently isolated differed markedly in pathogenicity and invasiveness from those which had been growing a short time on blood agar. Their activity was maintained longer when grown in tall columns of brain broth, a medium which somewhat approaches the anerobic conditions under which certain workers claim to have grown the filterable agent. He describes a difference in the appearance of the colonies in the first few transplants on hormone blood agar. He was also able to obtain positive results with filtrates of brain broth cultures of his streptococci which were sterile as tested by a week's incubation in the same medium, but as the lungs of the animals were not sterile post-mortem, he discounted his results. Blake and Cecil also record an observation interesting in the light of this conception of symbiosis. One of their control monkeys, No. 155, injected intratracheally with 4 c.c. of a suspension of *B. pfeiferi*, killed at a temperature of 56° C., while showing none of the other evidences of infection exhibited by animals infected with live cultures, did show moderate bronchopneumonic lesions when killed. Inasmuch as all who have worked with the filterable agent agree that its activity is not destroyed by the degree of heat used in this case, the observation suggests the possibility that the filterable agent may have been present with the Pfeifer organism used.

The possibility that the Pfeifer bacillus might itself have a filterable phase (suggested by the work of Löhnis and Smith, (12) and of Wade and Manalang), (13) or that a filterable organism might exist with it symbiotically, occurred to the writer during the course of the work on filtrates. If the Pfeifer bacillus could be recovered in its usual form from the filtrates of cultures, or, better, from the organs of animals infected with such filtrates, weight would be lent to the former hypothesis. This, however, has not occurred in our experience although repeatedly tried. On the other hand, if bacteriologically sterile filtrates of suspensions of *B. pfeiferi* from influenza cases should produce in animals lesions and symptoms comparable to those produced by the filtrates from influenzal sputa, support would be given to the latter idea. This condition we have been able to fulfill.

The first experiment was made with a strain of the Pfeifer bacillus obtained several months before from the Army Medical School and which had originally been isolated from a fatal case of influenza. It had been grown on artificial media at least sixteen months. A forty-eight-hour culture on heated blood agar was suspended in saline and

filtered through a Mandler filter. The filtrate was sown on the same medium and no visible growth ensued. Five c.c. of the filtrate was injected intravenously into a rabbit. The animal remained without noticeable symptoms for eight days and was then killed. Post-mortem the lesions described as characterizing animals injected with filtrates of influenzal sputum were found. An emulsion of the lung of this animal was prepared, filtered, and injected into two other rabbits with like results. A third passage in guinea pigs was successful and a fourth in mice. One of the latter animals died on the third day with characteristic pulmonary symptoms. Like experiments were then made with a second strain isolated during the pandemic, and with three isolated during the return outbreak of January and February, 1920. In all these positive results were obtained, though in the latter experiments no attempt was made to carry the virus through more than one passage. The same precautions were observed in every way and the same controls applied as in the published work on filtered sputum.

The net result, then, of the numerous recent investigations on the etiology of epidemic influenza appear to be substantially as follows:

1. Little has been advanced tending to strengthen the claim of the Pfeiffer bacillus to be regarded as the active cause of the disease.
2. The failure of many trained investigators to find *B. Pfeifferi* in the great majority of their cases, and the serological heterogeneity of strains, even from closely related cases, seem to be arguments against the etiological relationship of this organism to epidemic influenza.
3. French, British, German, and American investigators have all reported success in producing, by means of bacteriologically sterile filtrates, lesions that correspond well with the essential pathology of uncomplicated influenza as deduced from numerous descriptions.
4. Most of these investigators have failed to reproduce the clinical complex of the disease in this way. Only occasionally acute illness or even death has occurred after inoculation with filtrates. Olitsky and Gates describe the uniform occurrence of leukopenia.
5. When the last-named investigators found their lesions complicated by secondary infection, either through accident or design, the clinical complex and post-mortem findings of acute influenza were satisfactorily reproduced. They were able to show that the lungs of animals injected with the filterable "influenza substance" were markedly more susceptible to infection by known bacteria than are control animals. Bacteria that ordinarily kill by septicemia without localization are localized in the lungs and produce acute pneumonitis. The writer has made a similar observation.

6. E. C. Rosenow and Blake and Cecil have also been able to produce

conditions clinically and pathologically comparable to influenza by the intratracheal injection of bacteria. The conditions produced by these investigators appear to be very similar if not identical to those described by Olitsky and Gates. The exciting bacteria, however, were not the same, Rosenow using his green-producing streptococci, and Blake and Cecil, *B. pfeiferi*.

7. The suggestion is made that the filterable agent is capable of growing symbiotically with certain of the known bacteria without materially changing the character of the resultant colony; that when both agents are thus present in culture, injection produces findings comparable to those of influenza in man; and that this conception is in harmony with the known facts of the unity of influenza, its usually mild course, its severe or fatal course when dominated by secondary infection and with the fact that the secondarily invading organisms vary in their nature in different localities.

8. A few suggestive experiments are offered in support of this hypothesis.

NOTE.—Up to the time of writing of the foregoing article the question of cultivation of the filterable agent inferred from the experiments quoted was somewhat doubtful, as the positive results reported by British workers had been called in question by Arkwright. (14) However, Olitsky and Gates, (15) and Loewe and Zeman, (16) have now reported successful cultivation experiments that substantially confirm the earlier work and appear to establish the fact that the organism is cultivable. Olitsky and Gates propose for it the name *Bacterium Pneumosintes*. These authors also state that the organism grows symbiotically with numerous well-known bacteria of the so-called respiratory group, thus supporting the hypothesis suggested above.

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REPORT AND REMARKS ON A CASE OF ANTHRAX

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Anthrax in the human is not a frequent disease in many sections of the United States. Quite a large percentage of physicians have not seen it. In the last 38,000 admissions to this hospital, five have been anthrax. A period of nearly three years passed between this case and the last one. The other four came early in 1918 and have been written up as interesting examples for the Surgeon General in a previous report by the medical service of this hospital. Even were anthrax sufficiently common, this case had some unusual features that would justify its presentation. The rare features of this case were:

1. It was a solitary case.
2. There was a positive blood culture obtained.
3. No local treatment of surgical nature was attempted.
4. Intravenous antianthrax serum and symptomatic therapy were used exclusively in the active stage.
5. Less unusual were: 1. The outcome which ended in complete recovery with very little scar and no disability for duty as a soldier. 2. The probable causal factor, which was a new shaving brush, as in all the other cases here observed. This new brush was so defective that the soldier destroyed it after the first trial. This rendered the examination of the brush out of question.

F. D. L. was a laborer before entering the Army and had not been in the tropics. He admitted use of alcohol in moderation and denied venereal disease. There were no evidences of wounds or casualties. There had been no deaths in his family since his birth and his health had always been good, except for a mild attack of influenza in 1918. F. D. L. was a private, 18 years old, four months in the service and was born in California. He had been at Fort Sam Houston, Texas several months.

On May 11, 1921, he had a chill followed by fever, aching limbs, headache and sore throat. While it pained him to swallow, on close questioning this pain was on the side of the neck and below the jaw on the right side. The muscular action and motion attending the act of swallowing was the main factor in causing pain. The soldier was obliged to stop duty on the 13th of May because of weakness, pain in throat and fever. His illness was supposed to be acute follicular tonsillitis and accordingly he was transferred to this hospital. Examination revealed a well nourished young man, comfortably lying in bed,

temperature 102° F., pulse 114, respiration 24, with considerable swelling over the location of cervical glands, on the right side. The tonsils were enlarged and cryptic but not especially inflamed. By the morning of July 14, the soldier appeared much worse. He was prostrated, temperature 102°, pulse 108, respiration 28, and the swelling of right cheek and right side of neck had increased noticeably. The swelling extended from level of zygoma on right above, to mastoid posteriorly, clavicle below and mouth and nose anteriorly. It was not very tender and was diffuse. You could not pick out glands, as for instance the parotid or any of the upper cervical chain. The soldier could open his mouth fairly well. On the right cheek about 1½ inches posterior to mouth was a small skin lesion. This lesion was a small flat vesicle surrounded by a red border. The lesion was round and about a centimeter in diameter. In appearance it reminded me very much of a recent successful vaccination. The soldier had not given it any special attention and considered the usual pimple it that he had often experienced. The spleen was easily palpable. Gums, teeth, throat, nose, ears and scalp evidenced no acute disease and no other findings were demonstrated.

Smear from the vesicle demonstrated a long gram positive bacillus. The bacteriologist not knowing the nature of lesion thought of the possibility of it being the hay bacillus. On being informed the officer in charge advised handling the lesion as anthrax while awaiting culture. Blood count at this time resulted in finding 21,450 white blood cells, 86 per cent polymorphonuclear, 4 transitional, one large mononuclear and 9 small mononuclears. Blood culture taken May 14 was positive for anthrax bacilli and culture from local lesion also. Throat culture was negative for anthrax and diphtheria bacilli. Urine was normal, not even showing a trace of albumen.

Absolute isolation was established on the morning of the 14th and 100 c.c. of anti-anthrax serum were administered intravenously. This was followed by 50 c.c. more in the afternoon.

On the 15th the general condition of the patient showed no marked change. Temperature 103°, pulse 104, respiration 28. Swelling had increased considerably extending down into the throat. Soldier was rational and made very little complaint. The swelling was not very tender. On the evening of the 15th, the pulse rose to 130 and the soldier was somewhat delirious during the night. 100 c.c. of the serum were given on this date.

On the 16th the swelling seemed stationary, but it was enormous at the best. The soldier was rational during the day. Temperature was as high as 104° F. and pulse was 110. Administration of 100 c.c. of serum

was followed by a severe chill, responding well to adrenalin and atropine. Tincture digitalis minimis XXV every three hours for five doses was ordered. The patient refused nourishment. Delirium was present during the night.

On the 17th 100 c.c. of anti anthrax serum were given intravenously. No reaction noted. Tincture digitalis was ordered, given every three hours in minimis XXX doses. Swelling had not increased. The lesion on the cheek now has a black center about a centimeter in diameter surrounded by a raised border or crown of small vesicular lesions with a tendency to scabbing. The general condition was not encouraging, temperature averaging 103°, pulse 112 and respirations were gradually increasing, reading 34 and 36 on two records. No definite patches of pneumonia were detected, but indeterminate rales were heard over both lower lobes. Very little cough and no expectorate were recorded.

The 18th brought very little change. 50 c.c. of the serum were given intravenously. Swelling of face, neck and throat was receding slightly.

On the 19th symptoms were decidedly better, the temperature reaching no higher than 100°. General condition was good. No serum was ordered. He was taking his nourishment kindly.

On the 20th a diffuse urticarial like rash was present over entire body. It caused the soldier considerable discomfort and temperature reached 103° F. by the evening of the 21st. The digitalis was continued and calamine lotion with adrenalin hypodermically were ordered for the skin complication together with a saline.

The night of the 21st the soldier was very restless. We were puzzled at this time whether his symptoms were due to the serum or anthrax. Temperature was running 103° to 101°, pulse 100 to 96 and respiration 28 to 40. There was no evidence of consolidation in lungs, spleen was distinctly enlarged and the local lesion exhibited very little change. Administration of 100 c.c. of anti anthrax serum intravenously was ordered and given.

The night of the 22d was noted by much improvement in the symptoms and 100 c.c. anti anthrax serum were again given the morning of the 23d.

By the morning of the 24th the pulse, temperature and respiration were normal. The digitalis was discontinued. The urticarial lesions were gone. The general swelling was receding. A black eschar marked the site of the malignant pustule.

From this date the soldier improved in appetite and strength. He made no complaint whatever. Near the angle of the jaw, right side, the swelling remained and a softened area developed, which was

lanced. The pus from this focus exhibited no anthrax bacilli and healing took place in a few days. A general tonic was now being taken.

On June 16 the black eschar came off leaving a light red foveated area about 2 cubic centimeters long and one wide. It was scarcely noticeable at a little distance.

By June 30 convalescence was considered complete and the soldier returned to duty.

This is the fourth case with the care of which I have been personally connected. None of the others exhibited a positive blood culture. All the others were treated surgically by excision of the pustule and cautery or removal by cautery and with anti-anthrax serum intravenously. All four cases have recovered. Lt. Col. R. F. Metcalfe, surgical consultant in this case, saw no reason to operate in view of the positive blood culture. Major Wm. T. Weissinger, M. C., and Capt. W. R. L. Reinhardt, M. C., gave very valuable consultation and aid in the handling of this case. Capt. John R. Hall, M. C., furnished the photographs of the soldier.

Personally from my experience with anthrax I have the greatest confidence in its treatment with anti-anthrax serum. It acts like a specific. I would urge its use early, fearlessly, intravenously and in large doses 100 to 150 c.c. daily according to symptoms until improvement.

Cognizance of new shaving brush dangers warn us of necessary precautions in their initiation to continued use. A list of firms furnishing Standard Acceptable Brushes has been published by the Surgeon General.



FRACTURED SESAMOIDS AS A SOURCE OF PAIN AROUND THE BUNION JOINT

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FRACTURE of the sesamoid bones, which is frequently overlooked, is one of the causes of trouble in the neighborhood of the bunion joint. The symptoms, of which pain is the most prominent, are attributed to a sprain, bunion, arthritis, or some other local condition. The frequency of fracture of these bones is a much disputed point; various statistics have been published, which vary widely. Orr¹ examined one hundred X-ray plates of feet taken for various conditions and found sixteen divided sesamoids. Frieberg² examined one thousand plates and found only one sesamoid divided transversely. In the past year the writer has had six cases of divided sesamoids and an examination of ninety-seven other plates of feet taken during this period for all causes showed no division of these bones.

That the sesamoids of the great toe can congenitally be divided is possible. In comparing the identifying characteristics of a congenitally divided sesamoid with those present in a congenitally divided patella, we may say a sesamoid showing more than one piece and these pieces being free from ragged or irregular edges, with no history of injury, is a congenital abnormality and not a fracture. Of the plates of the six cases here reported only one would be placed under the heading of congenital division and this one complained of pain when walking. We should not forget, however, that a congenitally divided sesamoid may be the site of pathology and this should be borne in mind when the symptoms point to trouble in the sesamoids.

Shoes which tend to throw the weight of the body on the inner side of the foot would produce a greater strain on the fibers of the tendon connecting the two parts of the bone and thereby produce symptoms.

There is the possibility that some of the so-called congenital cases were fractures in early life, which healed without union and after a period of time the fragments became rounded and produced no further symptoms until some injury intervened calling for relief. Questioning the patients, who gave no history of injury immediately preceding the onset of symptoms, did not reveal history of previous pain. Children, especially those who run barefoot, have many injuries to their feet which are soon forgotten.

¹Annals of Surgery, May, 1918.

²Journal of Orthopedic Surgery, August, 1920.

The commoner causes of fracture are: First, direct violence such as heavy weights striking the dorsum of the foot; second, striking the sole of the foot on a hard surface from a fall or jump, and third, forcible hyperextension of the great toe. The age incidence of fracture is from fifteen to thirty-five or forty years.

Symptoms are: Pain in the proximity of the bunion joint with a definite point of tenderness over the sesamoid involved; swelling is absent, unless the fracture is the result of direct violence; crepitation is rarely elicited and in these cases could not be produced, but this is not remarkable in view of the fact that the tendon pull separates the fragments. Tenosynovitis in the tendon involved is not an infrequent complication.

There may or may not be a history of an injury, only three of this series of cases having such a history. Of these three, one had a heavy packing box fall on his foot; the second had a motor truck run over his foot, and the third gave a history of hitting the great toe against a chair in the dark, but did not recall having any pain until she attempted to walk the next morning. The plate of this case, taken three weeks after the onset of the pain, showed callus formation between the two fragments, which were of regular outline.

The diagnosis is made on the foregoing symptoms and X-ray examination, the latter being the only means of making a positive diagnosis. Fractures are frequently called sprains and are treated as such, but in fracture the symptoms always return, unless treated over a long period of time.

Treatment: Fracture may unite with a bony union, if treated by absolute rest for an extended period. Where bony union is accomplished the callus is the source of pain for some time after the use of the foot has been resumed without protecting pads. In Case No. 2, which was seen two years after the accident, there was callus formation but no union; this patient was treated at the time of the accident for a sprain and was kept off of the foot for a long time, but pain reappeared after very little standing or walking. Immediate removal of the fractured sesamoid probably produces better results than immobilization, due to the earlier resumption of function without pain. It is advisable to remove both sesamoids, for a better functional result ensues than when only the injured one is removed. This can easily be done under local anaesthetic; the incision should be so placed that it is not on the weight-bearing surface.

Case No. 1.—White; male; aet. 40; occupation, stevedore. Entered with history of packing box of about two hundred pounds weight falling about three feet, striking left foot. X-ray shows fracture of second

and third metatarsals and fracture separation of mesial (tibial) sesamoid bone of the great toe.

Due to contusion and coexisting fractures the sesamoid was not removed.

Case No. 2.—White; male; act. 24; occupation, clerk in retail store. Complained of pain under right great toe. This pain was not present if he did not have to stand or walk much. The pain was first noticed after an auto truck had passed over his foot while with the army in France. Was treated at the time for sprain, but the pain under the toe did not entirely disappear. X-ray taken two years after the accident shows the lateral, (fibular) sesamoid divided into two irregular bodies with a slight amount of callus thrown out between them.

Both sesamoids were removed under local anaesthesia and one month after removal the patient was free from pain when walking, which was not possible before the operation.

Case No. 3.—White; female; act. 28; housewife. Complained of pain around bunion joint of left great toe. Had first noticed it two weeks before upon arising in the morning and since that time the pain had not varied greatly. She remembered having struck her toe on a chair in the dark when retiring the night before the onset, but did not remember having very severe pain at the time. Examination showed a definite point of tenderness over the sesamoid and the X-ray revealed a fracture of the mesial sesamoid.

The sesamoids were removed under local anaesthesia and the pain disappeared.

Case No. 4.—White; female; act. 32; stenographer. Entered complaining of pain in the right bunion joint after much walking. First noticed it about two months before entrance. Did not remember injuring it, but first noticed the pain while at a dance and had to leave because of it. Was off of the foot for several days and then gradually began using it, but a moderate amount of use caused the pain to return. Examination showed pain over the lateral sesamoid, with pain of lesser degree extending along the flexor tendon of the great toe for about six cm. from the sesamoid. X-ray showed the sesamoid divided, with no apparent callus formation.

Patient refused operation and dropped from sight.

This case probably had a mild degree of tenosynovitis of the flexor tendons and would be classed as fracture, due to overextension of great toe, due to dancing in high-heeled shoes.

Case No. 5.—White; female; act. 18; school girl. Complained of pain of an indefinite character around the base of left great toe. First noticed on preceding day, but no history of injury of any kind was

obtained. Examination showed very little tenderness. X-ray disclosed a division of the mesial sesamoid, the two parts being unequal and not regular in shape, with an absence of any callus formation.

A pad of felt hollowed in the center was placed under the joint and the patient complained of no more discomfort.

This may have been a fracture received in earlier life and some slight injury set up a mild inflammation.

Case No. 6.—White; female; aet. 27; clerk. Entered complaining of pain under ball of right great toe. No history of injury. Examination showed tenderness on pressure over sesamoids. X-ray showed mesial sesamoid divided transversely, with two well-rounded fragments.

Classed as a congenital separation and treated with a felt pad, with immediate improvement.



POST-WAR MEDICAL CONDITIONS AMONG ARMENIAN REFUGEES IN SOUTHERN TURKEY AND SYRIA

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(With five illustrations)

SINCE the conclusion of the great war, there has been in both Europe and America a keen interest, political as well as humanitarian, in the fate of the Armenian people, and American humanitarianism has manifested itself most strikingly in the maintenance, by popular subscription, of a widely organized relief work for these and other war sufferers in the Near East. It has seemed, therefore, that a report on the medical condition of a large remnant of these people might have a special interest at this time. But before discussing the observations on which this report is based it may be well to review briefly the circumstances leading up to the conditions to be described.

When the war began in 1914, there were, according to the best available records, about a million and a half Armenians living in Asiatic Turkey. A majority of these were settled in Central and Eastern Asia Minor, where in several vilayets (Van, Bitlis, Erzerum) they constituted a possible majority of the population. The story of their wholesale deportation in 1915 is too well known to require repetition. Many fled eastward toward Russia but the majority were driven southward in the direction of the Arabian desert.

Those fleeing East, some four or five hundred thousand in number, crossed the Turkish border into the Russian Caucasus provinces, where, added to the predominant native Armenian population, they formed a unit capable of protecting itself. It is this group which constitutes at the present time the largest surviving remnant of the nation. A republic was set up here after the Armistice, but its government, though recognized by the Allies, is at present writing very unstable, owing to hostile political developments in the adjacent countries (Turkey, Azerbaijan, Georgia and Soviet Russia), the discussion of which does not lie within the scope of this paper. The health conditions prevailing in this new republic of Armenia in 1919-1920 have been recently thoroughly reviewed by Maj. Walter P. Davenport, U. S. A., Medical Director of the Caucasus Branch of the Near East Relief.²

The larger part of the Armenians of Asia Minor, variously estimated at one-half to one million persons, were driven down into Mesopotamia

¹ Director, Aleppo District of the Near East Relief, on leave of absence from the Yale University Medical School.

² *The MIDDLE EAST SURVEY*, 1921, N° VIII, 179.

and Syria. It is with the survivors of this second army of exiles that we are concerned in this report. Whatever the number that started, it is certain that a majority perished along the way or in the Southern desert, from massacre, hunger or disease. Relatively few of the great mass which followed the Tigris and Euphrates into the Mesopotamian plain ever came back, and among those who escaped death were many women and children sold to Kurds, Turks and Arabs as wives and servants. Those who wandered on into Syria fared best and from there came the largest proportion of survivors. When the British advanced into Palestine and Syria in 1916-1918, they gathered together the destitute refugees found there and placed them in camps in Port Said, Damascus and elsewhere, where they were given food and shelter.

After the Armistice, the task of repatriating these exiles was taken up by the allied forces of occupation, British and French. Aleppo, which is the junction point of the Constantinople-Bagdad railway, with the French railway running south to Beirut and Damascus, and connecting at the latter point with the lines to Haifa and Egypt, and the Hedjaz line to Medina, became quite logically the assembling and distributing station for the returning exiles (Fig. 1). They were removed to Aleppo by train, where shelter was provided in the old Turkish military barracks until they could be moved on towards their homes in the North. In addition to these refugees from Syria, there were many who wandered into Aleppo from the desert towns and villages. The overflow from the Barracks Camp, which could accommodate only about seven thousand persons, was quartered in empty buildings in the city.

Only approximate figures as to the total number of Armenians returning can be given. From January to November, 1919, when the movement practically ceased, there was an average of five thousand arrivals and departures at the Aleppo camp each month, making a total of some 50,000. A considerably larger number, possibly 75,000, were quartered in the city during this period, and were thus not registered at the camp. If to these be added some 50,000 who returned by other routes, and 75,000 as the number still remaining in Arabia, Syria and Egypt, we can account for only about 250,000 out of possibly a million who set out from their homes in 1915, a survival of not more than one in four. In these figures, the heart of the Armenian tragedy is seen.³

In order to aid in caring for these destitute people, among whom were orphans, helpless women and many sick and infirm, the American Red

³ The Turkish nationalist uprising, launched against the forces of occupation early in 1920, not only stopped the repatriation of Armenians, but led in places to a renewal of massacre and exile, so that the number of survivors has been further materially diminished, and will undoubtedly continue to diminish until the present conflict ends, and a stable, just government is instituted.

Cross opened a relief center in Aleppo in February, 1919, soon after the return movement began, and subsidiary relief stations were established shortly afterward in the chief cities and towns of Southern Asia Minor, toward which most of the refugees were being moved. On March 1, 1919, the responsibility for all relief in Turkey and Syria was assumed by the Near East Relief, by agreement with the American Red Cross, and the organized work was formally taken over by the former agency shortly afterwards.

On April 1, 1919, the writer assumed direction of the medical phases of the relief work in the Aleppo territory, and on July 1, 1919, he took over the general supervision of all the Near East Relief activities in this area, continuing in this position to July 1, 1920. It is on observations, which these positions made possible, that the present report, dealing particularly with the medical side of the work, is based.

The territory comprised in this relief area, as shown in the accompanying sketch map, includes part of Syria and Mesopotamia, as well as that section of Asia Minor which lies south of the Taurus range, with the exception of the Cilician plain. It is the district of which Aleppo is normally the commercial center, and takes in the Turkish cities of Aintab, Marash, Ourfa, Mardin, Diarbekr and Alexandretta, in all of which subsidiary relief stations were established. The headquarters and base of supplies, as already indicated, were in Aleppo. It might be stated in this connection that following the Armistice, British forces occupied the greater part of this territory with garrisons in Aleppo, Aintab, Marash, Ourfa, and Alexandretta. In November, 1919, the British were replaced by French troops, who in the fighting with the Nationalist Turks, which began early in 1920, were driven out of Marash and Ourfa. While the Near East Relief was quite independent of military control, and extended its activities throughout the unoccupied as well as the occupied territory, there was everywhere in the military controlled zone the closest cooperation between the two organizations. In general the military authorities accepted responsibility for providing food for refugees awaiting repatriation, and transportation to their homes, when the way opened. The Near East Relief supplied medical aid, clothing, industrial employment, in addition to institutional care of orphans and of women rescued from Arabs and Turks. Much of the relief work was carried on jointly. For example, the large refugee camp occupying the Turkish Barracks in Aleppo was operated on military lines, with American administrative personnel, but mostly on funds supplied by the British Military.⁴ The American administrators were

⁴ The Aleppo Barracks comprised a group of buildings, mostly two stories high, arranged in the form of a quadrangle, the inside court of which measures 1,000 by 500 feet. During the war the place provided accommodations for 10,000 infantry or 5,000 cavalry. When taken over for a refugee camp,

directly responsible to the British administrative Commandant, both for funds expended and for the proper conduct of the camp. The fact that during the entire period of British occupation, which ended November 1, 1920, there was never an instance of serious friction between the two organizations, is evidence of the splendid spirit of cooperation which prevailed.

The extent and character of the American relief work is indicated by the following list of institutions and bureaus in the city of Aleppo.

Non-Medical:

- Refugee camp (in cooperation with the British).
- Orphanage camp (a collecting and distributing station).
- Rescue Home for Armenian girls rescued from Arabs and Turks.
- Industrial Shops.
- Bureau of Employment, Relief and Inquiry.

Medical:

- General Hospital and Clinic, in Refugee Camp.
- Eye Hospital and clinic.
- General clinic in city.
- Special orphanage and rescue home clinics, for eye and skin diseases.
- Base laboratory.

In addition to the above, there were district administrative officers, automobile repair shops and warehouses.

In each of the six sub-stations the work was similar to that in Aleppo with the chief difference that there was less of the refugee problem and more of rehabilitation.

The hospital system in the relief area included eight small institutions having an average of fifty beds each. Fortunately, in most of the stations, American mission buildings, well constructed and excellently adapted to the purpose, were available. One of the hospitals was for the care of eye cases only. The others were general hospitals but were nearly always filled with surgical cases and those suffering from the more severe medical disorders. During periods of special need, additional beds were provided in temporary tent wards. There were eleven dispensaries in the district, not including special orphanage clinics.

the buildings were unspeakably filthy and infested with vermin, among which fleas and bed bugs predominated. The location on the crest of a hill, overlooking the city, was advantageous in many ways but the water problem was most serious in that the only available supply was an old Roman aqueduct running through the hill, 90 feet below the surface. From this the water had to be lifted by a primitive arrangement, consisting of a bucket wheel apparatus operated by mule power. Needless to say, the organization of a hygienic camp and hospital under such conditions was fraught with many difficulties. Not the least of these was the disposition of human excrement. To change the habits of the Oriental and make him use a bucket latrine instead of the open hill-side, was accomplished only by a show of military authority with which the American relief administrators were fortunately invested by the British.

The medical personnel for this work included an average of ten American doctors, fourteen American nurses, aided by twelve native (Armenian) doctors and a number of Armenian girls having more or less training as nurses. The volume of work done is indicated by the following figures:

	<i>July</i>	<i>December</i>	<i>Approximate yearly total</i>
Number hospital admissions	759	866	9,600
Number of operations	204	218	2,000
Number new cases in dispensaries	8,271	6,080	72,000
Number of old and new cases in dispensaries (total visits)	30,963	29,695	350,000

In the following brief review of medical conditions of the returning refugees, as seen particularly in the hospitals and clinics, we shall take up first the general physical condition of the people, and the relation to this of food supply and climate. We shall then discuss summarily some of the more important or striking features of the prevailing diseases.

General Physical Condition of Refugees.—While the majority of refugees arriving in Aleppo were poorly nourished, and more or less anemic, examples of marked emaciation were exceptional. As stated above, many had come direct from concentration camps in Southern Syria or Egypt, where they had received a limited but adequate ration. But even the filthy and ragged who wandered in from the desert, where they had lived three years or more with nomadic Arabs, showed in most cases no outspoken signs of malnutrition. It must be remembered, however, that the weak and decrepit, both young and old, as well as the halt, the lame and the blind had succumbed early from the hardships of the deportations. In other words, the returning refugee exemplified the survival of the fittest, and in spite of his rags and dirt, he did impress one with his hardiness, and as we shall point out later, his relative resistance to certain types of communicable disease.

There were, furthermore, no examples of special dietary deficiency; that is, we did not observe any of the commoner deficiency diseases, such as scurvy, beri-beri or pellagra,⁵ although there had been, some time

⁵ Rickets, as recent investigations by McCollum and Park, Sherman and Pappenheimer and others, tend to show, should undoubtedly be included among the deficiency diseases. The condition is said to have been extremely rare in Turkey and Syria before the war, but many cases were seen during and since the war particularly among refugee children. In this connection it may be of interest to note that olive oil, the therapeutic value of which in rickets is generally recognized, normally enters largely into the diet of the people of the Near East, old and young. During the war, however, there was a shortage of the product in many districts owing to the use of olive trees for fuel and the interruption of trade. The rapid improvement in cases among refugee children placed on the normal oil-rich diet was very striking. The amount of food in Southern Turkey and Syria was adequate to meet all needs. The problem was entirely one of distribution. In this respect the situation was much less serious than in the Republic of Armenia in the Russian Caucasus, where in 1919-1920, as Davenport reported, it was only through the importation of large quantities of food by the Hoover Administration and the Near East Relief that wholesale starvation was prevented.

before, an outbreak of pellagra in one of the detention camps from which several thousand of the refugees had come and the writer saw several cases in Beirut. A brief review of the common foods of the country will probably indicate the reason for the rarity of deficiency diseases, even under refugee condition of living.

Food.—The staple article of diet is bread, made of whole wheat and cooked with or without yeast. Among the villagers the unleavened variety is generally seen; the city dwellers prefer the other. Whole wheat is also eaten in the form of a porridge. Green vegetables, particularly tomatoes, cucumbers and peppers, are a regular part of the diet. Sugar is obtained chiefly in the form of fresh or dried fruits (grapes, apricots and figs) which are abundant and cheap. Mutton, fowl and eggs are fairly plentiful but relatively expensive, and do not enter largely into the diet of the poorer classes. Milk of goats and donkeys is widely consumed; not the fresh product but in the form of soured preparations made by the addition of one or more varieties of the well known *B. bulgaricus* organisms. Butter is too expensive for general use; cheese is somewhat cheaper and very popular. There is a universal craving for fats, met chiefly by olive oil or mutton fat (derived from the caudal organ of the locally prevalent fat-tailed sheep) with which nearly all foods are liberally cooked, much to the disgust of the average Westerner. The regular diet of the people is certainly relatively high in carbohydrates and low in protein. But an abundance of nuts (acorns, pistachios, walnuts) and a fair supply of protein-rich cereals, such as beans and lentils, apparently serves to make up for this deficiency.

The dietary of the average refugee, needless to say, did not include the various articles just mentioned. In general he had to subsist mainly on bread and raw vegetables. Indeed, for a short time, in the early days of the Aleppo refugee camp, the free ration issued consisted of bread only. The effect was seen not only in the general lowered state of nutrition but in the large number of cases coming to the clinic complaining of gastric distress (pain and acid eructation), for the temporary relief of which enormous amounts of sodium bicarbonate were dispensed. By providing a daily cooked meal of meat and vegetables, gastric complaints rapidly diminished.

The Effects of Climate.—The climate of North Syria is very much like that of parts of our Southwest. There is a long, dry, hot season, and a short, more or less rainy winter, which varies in severity with the altitude, the mountains being cold and snowy and the plains balmy. The climate therefore may be considered temperate, contrary to the general opinion in the West, except for the narrow coastal plain where it is distinctly sub-tropical. The refugees had lived mostly on the island

Southern plains, so that though ill clad they had not suffered so much from the immediate or secondary effects of cold, as from those diseases which are favored by heat, dust and scarcity of water; namely, skin and eye infections, and, as will be explained in a later paragraph, malaria. While it might have been expected that the outdoor life in a dry climate would have served as a prophylactic against tuberculosis, this presumably favorable factor was evidently offset by certain unfavorable conditions including uncleanness, crowded living and poor food, for both pulmonary and bone tuberculosis were greatly increased by the refugee life.

The extent to which the climate has influenced the structure and arrangement of dwelling houses in the Near East and so indirectly affected health conditions is very interesting. To afford protection against the sun and dust of the long hot summer, the houses in the cities are compactly built on narrow streets with a minimum exposure to the sun, which reaches the living rooms only through a central court. There is therefore a dearth of light and ventilation, especially in the winter months, when the rooms are tightly closed and heated by charcoal braziers. In the villages one sees the same effective effort at the exclusion of the sun in summer and the cold in winter. Fig. 3 shows a typical narrow city street and Fig. 4 an Arab village with its characteristic bee-hive houses which have a single door, no real windows and only an occasional small ventilating aperture in the roof. It should be explained that true country life, as we know it, with more or less isolated houses, is rarely seen in Turkey or Syria. In spite of the fact that agriculture is the principal industry, the people live either in cities or in compact villages and the crowding is often quite as marked in the latter as in the former. Even the Arab nomads generally pack themselves in their tents and so nullify the wholesome influence of a pastoral life. Needless to say, the Armenian deportations, with the resulting shifting of population toward the South, intensified the already inadequate housing situation in Syria and Mesopotamia. The influence of this factor in the spread of infections among the refugees is emphasized in the succeeding paragraph.

PREVALENT DISEASES.

Eye Diseases.—Among the large disease groups encountered, eye infection, with its sequelae, stood easily first. As a rule, the number of eye patients seen daily, at any general clinic, exceeded that of all others combined. This was not surprising in view of the remarkably high incidence of eye diseases known even in normal times throughout the Near East, particularly among the poorer classes. It has been con-

servatively estimated, for example, that in Southern Asia Minor and Syria more than 50 per cent of the permanent population is affected, and that the figure reaches 90 per cent among the fellahin (peasants) of Egypt. Heat, dust, filth and flies are no doubt among the factors responsible for these conditions. Some idea of the nature of the eye maladies encountered and their relative frequency is given in the following figures, from one of the Aleppo clinics, covering a four months' period:

Total eye cases	1,938
Trachoma	384
Other types of conjunctivitis	534
Staphyloma	131
Corneal ulcers	70
Entropion	75
Ectropion	12
Cataract	24
Pannus	88
Leukoma	170
Glaucoma	11
Refraction	12
Iritis	11
Blepharitis	44
Miscellaneous	232

The predominance of conjunctival infections is evident, as is also the large number of complications of such infections (corneal ulcers, staphyloma, trichiasis, entropion, etc.). The small number of refraction cases is explained by the fact glasses were not supplied by the Near East Relief and were not obtainable nearer than Egypt. Since the Eye Hospital in Aleppo was the only institution of its kind in this part of the country, it was naturally continually filled with operative cases. Those interested are referred to a report⁶ of Dr. A. S. Tenner, Director of the Hospital, reviewing some phases of the work done there. It may be remarked in passing that although permanent hospitals of this kind, for the treatment of eye diseases, constitutes one of the most appealing needs of the Near East, it is obvious that real amelioration of the present conditions can be brought about only by striking at the source of the trouble; namely, the unhygienic conditions of living. So long as great over-crowding in dark and dirty houses, lack of bathing facilities, and the virus-carrying fly prevail, the irritating dust and wind of the East will make the conjunctival soil suitable for contagion and the incidence of infection will remain high.

The importance of hygienic conditions in the treatment, as well as the prevention, of trachoma, was well demonstrated in the comparison of two

⁶ *N. E. Med. Jour.*, 1921, Vol. CXIII, No. 10

orphanages in Aleppo. One was a newly established institution, with its eight hundred children quartered in army tents, in a well-ordered camp, with large playgrounds, ample bathing facilities, no crowding, strict personal hygiene. The other with 1,600 children occupied dirty, poorly lighted stone buildings, inadequate bathing facilities and much overcrowding. The class of children admitted was the same, and incidence of trachoma was approximately 60 per cent in each. Identical methods of treatment at the two institutions under the supervision of American physicians and nurses gave very different results. Within three months a majority of the cases at the Camp orphanage were dismissed cured, whereas at the other institution there were very few cures. Furthermore, at the latter a certain number of new cases had developed. Later experience showed that in institutions of the second type recurrences or reinfection were very common, making efforts at eradication quite fruitless so long as living conditions were not materially bettered.

Skin Diseases.—Next to eye infections, skin diseases presented the largest single medical problem among the refugee element. In addition to scabies and favus, there were many cases of eczema, psoriasis and tropical ulcer. Scabies was particularly rampant wherever the people were massed together, and there were many aggravated cases with severe secondary infection. In many of the orphanages the disease was eradicated by isolation and treatment, but this was not possible in the general population or even in the refugee camps. In treating the disease, the classical sulphur ointment was used; the fatty menstruum being sometimes butter or olive oil, in the absence of petrolatum. On account of the high cost of even these native fats, an aqueous sulphur compound (Vlemmiez solution) was very effectively employed. The enormous number of cases treated is shown by the fact that the initial supply of five hundred pounds of sulphur lasted only a few months. Favus, which was even more prevalent in some districts than scabies, and often associated with the latter, was patiently but successfully treated with oil of cade and sulphur ointment, plus depilation, X-ray not being available. The tar cap, popular among native physicians and laity, we recognized as an excellent depilatory instrument but it was not used in our clinics for humane reasons.

Tropical Ulcer.—To us the most interesting of the skin diseases met with was the *Aleppo button*, a form of tropical ulcer. The lesions are of striking and characteristic appearance. The sores of "buttons" as they are called, which appear on the exposed parts of the body, most often the face or hands, start as small, red pimples, increase to the size of a half dollar or more, and become ulcerated and crusted over with a scab. The roundness and elevation gives the fancied resemblance to a button.

The lesions may be single or multiple, but rarely does a person have more than four or five, and generally there is only one or two. Unless properly treated, the sores last nine months to a year. A permanent immunity results, and this is said to have led the Bagdad Jews to inoculate their children early on the legs in order to avoid the possibility of a naturally acquired infection on the face with resulting disfiguration. The exudate from the sore is infectious so that inoculation can be easily carried out. How the disease is ordinarily transmitted is not known but it is presumably through the agency of some biting insect. The fact that the lesions are practically always situated on an exposed part, extremities or face, suggests a fly or mosquito transmission. In Aleppo many buttons were seen among the refugees, particularly children, and at least 30 per cent of the older children in the orphanage had scars of healed lesions or fresh buttons. It was the general opinion among the native physicians that the infection had become more widespread during and since the war, but there were no satisfactory statistics to prove this.

The infection is not, as the name might suggest, peculiar to Aleppo or its environs, though it is perhaps more common there than in most parts of the East. It is, however, very widely distributed, cases being found throughout Syria, Palestine, Mesopotamia and northern Africa, and sporadic cases in central and northern Turkey. Furthermore, the Delhi boil of India is now recognized as the same disease, which calls to mind the fact that even in nearby Palestine the name "Jericho button" is applied, this city on the Dead Sea, being, like Aleppo, a particularly active center of infection. The writer saw in Jerusalem cases identical in appearance with those in Aleppo and showing in smears the same characteristic organism. This protozoan organism (*Leishmania tropica*) was discovered in 1903 by Dr. Homer Wright,⁷ of Boston, who demonstrated the parasite in smears from a sore on the face of an Armenian girl who had come to America. The etiological relationship of the parasite of the disease having been established beyond doubt, the infection is not properly termed cutaneous Leishmaniasis, Aleppo button, Jericho button, Delhi boil and Oriental sore being popular or local names for the same disease. But it is interesting and noteworthy that cutaneous Leishmaniasis presents in different parts of the world a variable clinical picture. For example, the writer was impressed with the striking differences between the disease seen in Aleppo, as regards gross features of the lesions, their distribution on the body and the clinical course, and the American form of the disease, which he had an opportunity of studying several years ago in the Amazon Valley. The organism in both cases was morphologically the same, which suggests very

⁷ *Jour. Med. Res.*, 1903, 10, 172

strongly the existence of several definite varieties of *Leishmania tropica* which it has not been possible thus far to differentiate by staining or cultural methods. It seems more than likely that further studies will bring to light types of organism corresponding to the several clinical types of the disease. Locally, the treatment of choice is the X-ray to which the responsible parasite seems particularly susceptible. Freezing by carbondioxide snow, however, effects a prompt cure, according to Adams of the American College at Beirut, who has had a large experience with this method of treatment. Aniline dyes locally applied are very popular with the laity and local physicians, and according to Adams have a certain curative value which he refers to their light-excluding property. He believes that the benefits resulting from the application of ordinary mud (a common practice among the natives) are to be referred to this same property. The disease is self-limited and sores practically always heal within a year, even though left untreated. But in such cases, secondary infection very regularly supervenes with considerable destruction of tissue and resulting scarring. Among the Armenian and Syrian girls many attractive faces are thus marred by these disfiguring scars of healed lesions, which should and could be prevented by early and proper treatment.

Malaria.—In spite of the long dry season, low rain fall and consequent scarcity of water, malaria we found to be the most common of the infectious diseases. The explanation of this apparent paradox lies in the fact that the long rainless period necessitates the conservation of rain water in cisterns and the irrigation of gardens and fields about the towns and villages, and thus brings about circumstances most favorable to mosquito breeding. Certainly these insect pests do abound from April to October or later throughout the Aleppo district, and malaria is everywhere endemic. We observed, however, that as in most malarious countries, there is a tendency among both the laity and native practitioners to class as malaria every fever or obscure ailment, to make it the diagnostic scrap pile, as it were. As bearing out this idea, it might be pointed out that in the American Relief Hospitals, where the diagnoses were systematically checked by laboratory blood examination, the number of malaria cases was proportionately much lower than in the dispensaries, where laboratory tests were not regularly made, and where native physicians were responsible for most of the diagnoses. However, even granting a large margin of error, the dispensary figures at all of our stations would still show an astoundingly high per cent of malarial cases. For example in one of our Aleppo clinics there were recorded in a period of six months June to December 1919, 1,437 cases of malaria out of a total of 3,256 medical patients; that is 44 per cent.

Of the total dispensary admissions, they were a little more than 22 per cent. The figures at several other stations were almost as large. As to types of malaria, we found that simple tertian predominated everywhere and at all seasons, although a marked increase of sub-tertian was observed toward the latter part of the summer. Only a few cases of quartan infection were seen, and these were refugees who had probably acquired their infection in southern Syria or Palestine, where, in certain sections, the type of malaria was said to be especially prevalent. We saw no examples of malignant or fatal infection, although cases were said to have been common on the Adana plain nearby. The majority of cases were more or less chronic and showed enlarged spleens, but we did not see the enormous splenic enlargement observed in some other malarious countries.⁸ Under the present conditions of the country, the problem of eradicating malaria, or even reducing its ravages to any extent seems well nigh hopeless. Needless to say, the screening of houses or beds is practiced by only a few of the well-to-do and there is practically no attempt to diminish mosquito breeding. The purchase of quinine for the sick offers a serious difficulty in itself, with the wholesale price of the drug around \$50 to \$75 a kilo, to which the retailer's profit must be added. And since the Oriental drug vender is no less careful of his profit than his Western contemporary, the price to the consumer is in most cases prohibitive. American charity is thus the sufferer's only hope.

Two other tropical fevers encountered deserve special mention; namely sandfly (*Phlebotomus*) fever and relapsing fever.

Sand Fly Fever.—This fever as is now generally recognized, is a specific acute infection of short duration, similar to dengue, to which it is probably closely related etiologically. It is widely distributed throughout the East, and is endemic in Aleppo, and most other cities and towns of Asia Minor and Syria. The disease makes its appearance early in the summer, with the arrival of the sand-fly, and cases are seen from then to autumn. The disease is characterized by its short duration, sixty to seventy-two hours, the absence of relapse, and the marked weakness and depression that exists not only during but for some time after the fever has gone. There is no leukocytosis, no splenic enlargement and no demonstrable parasite in the blood. There is some question as to whether or not one attack conveys a permanent immunity. The investigations of Doerr seem to prove that it does, but native physicians insist that second attacks are not uncommon. Westerners entering the country for the first time are particularly susceptible to the disease.

⁸ There were no spleens comparable in size to those which the writer found such a familiar sight a few years ago in the Amazon Valley.

About half of the American relief personnel suffered an attack during their first season, but there were no complications or sequelae, except for the extreme lethargy already mentioned as characteristic of the infection.

Relapsing Fever.—A number of cases of this infection were seen. The condition was readily distinguished from malaria by blood examination, the characteristic spirillum being easily demonstrated, as well as by the typical fever curve. The treatment was simple in that a single dose of salvarsan generally effected a cure.

Typhus Fever.—Only sporadic cases were encountered among the refugees although in the Spring of 1919 the writer saw a considerable number of cases in the Arab military hospitals. The disease was moderately severe with a fairly high mortality. Serum agglutination with *B. proteus* (Felix-Weil reaction) proved extremely useful in differential diagnosis. In view of the great prevalence of body lice and the crowded conditions of living among the refugee population, the relatively low incidence of the disease in the post-bellum period is noteworthy. It may be that the severe, widespread epidemic two years before, which decimated the country in places, may have left in its wake relatively few susceptible persons.

"Water-borne" Diseases.—The small number of cases of typhoid, cholera and dysentery seen is interesting and somewhat puzzling in view of the apparently ideal conditions for the spread of diseases of this group. Either through choice or necessity, personal uncleanness in the East is the rule. Flies abound everywhere and are free to feed alternately on human excrement and exposed food stuffs in market and kitchen. In houses which boasted a cesspool, the toilet is, as a rule, conveniently placed next to the kitchen, with the result that in entering a house, the uninitiated may be puzzled at the curious blending of odors that greet him. The water supply, too, would seem in most places to be a potential source of infection. The cities are as a rule supplied through open aqueducts; some of them relics of Roman days, with little or no protection against contamination. While in Aleppo there is a well built pipe line constructed by the Germans during the war, bringing water from fairly well protected springs outside the city, offering its supply to the public through "fountains" at occasional street corners, there are here, as in every other town and village, surface wells or cisterns in every house. These latter are filled largely by rain water, but are not protected against seepage. Repeated chemical and bacteriological examination in our laboratory of the piped water showed it to be of excellent quality but the cistern water, so generally used, was in most cases little less than dilute sewage, as the following, average figure as to chlorine content show.

	<i>Chlorine, parts per million.</i>
Piped fountain water,	5
Cistern, Near East Relief House	150
Other cisterns	100-200
Compared with	
Rain water (Mason)	8-22
American rivers (Mason)	5-10
Ordinary sewage (Mason)	110-160
Urine (Mason)	5872

In spite of disease-favoring sanitary conditions, we observed, as indicated above, only an occasional case of typhoid fever, relatively few of dysentery and no cholera. The explanation for the low incidence of this group of infections offers difficulties. The idea might be advanced that a majority of the people acquire in childhood immunity, as the result of mild infections. But this, of course, is mere speculation. In considering the problem, it should be kept in mind that the refugees upon whom our observations were chiefly made, represented a selected group, in that they were survivors of a large mass of people, many of whom had undoubtedly succumbed to these very infections. But the fact that the fixed, as well as the refugee population, showed the same apparent relative immunity would seem to rule out this explanation. In any case, the observation that a people may live under the conditions described without being decimated by typhoid, cholera and dysentery, is noteworthy.

Other Communicable Diseases.—In view of the general conditions of living, already referred to, we were agreeably surprised at not having to contend, either in the Aleppo refugee camp or elsewhere, with any serious epidemics. Small pox is endemic throughout the country but vaccination is widely practiced among the Armenians and to a less extent among Turks and Arabs. All refugees arriving in Aleppo, not showing a definite scar, were re-vaccinated. Scarlet fever, it was claimed, was not known in the country before the war, and while a few cases were reported in Syria, during the military occupation, we saw none among the refugees. There were sporadic cases only of diphtheria and epidemic meningitis. At one of our stations, there was an epidemic of mumps among the orphanage children, and measles swept through another large institution with many cases of bronchopneumonia following, but these outbreaks presented no unusual features. In the Aleppo Camp, there was a sore throat epidemic early in 1919 but the infection was mild with no serious complications. Influenza will be referred to in connection with respiratory diseases.

Intestinal Parasites.—These were exceedingly common throughout the region, and in both the refugee and fixed population. For example

among 3,256 medical patients in one Aleppo clinic, the diagnosis was "round worms" in 345 instances and "tape worms" in 125 others. But these figures give but a poor idea of the extent of worm infestation, as indicated by the results of the routine examination of stools of 100 orphanage children. Ninety-five of these were found harbor one or more of several varieties of nematodes, oxyuris standing first, with umbricoides and trichiuris in second and third places. No instance of hookworm infection was seen, although a careful search was made in a series of several hundred cases. The tapeworms seen were exclusively taenia saginata. It was impossible to treat all cases of taeniasis because of the limited supply of vermifuge procurable. Furthermore much of the male fern purchased locally at exorbitant price was found to be quite inert.

The high incidence of intestinal parasites is undoubtedly referable, first to the general uncleanness of the people, with, in the case of round worms, direct oral infection, and secondly to the universal shortage of fuel which leads to the consumption of much uncooked, or insufficiently cooked food.

Of other metazoan parasitic infection, there were few. An occasional echinococcus cyst of the liver was discovered. It is quite possible that autopsies and exploratory laparotomies would have revealed many more. Bilharzial infection of the bladder was observed in only a few cases, and these were in refugees who had been in Egypt, where according to the investigations of Leiper and others, more than 50 per cent of the population is infected.

Respiratory Diseases.—With the exception of tuberculosis, serious respiratory infections were not common. Only a few cases of lobar pneumonia were seen. In the winter of 1919-1920 there were indeed a considerable number of influenza cases, but they were mostly mild infections, very few terminating in pneumonia. The great epidemic had passed over the country in the summer of 1918 but from the accounts of local observers, the disease did not affect so large a proportion of the population as in the United States and the mortality was lower. Ordinary colds were certainly far less frequent than in our Eastern States. The American personnel rejoiced in their relative freedom from the usual seasonal coryzal to which most of them were accustomed at home. The dryness of the atmosphere is no doubt one of the favorable factors, although the absence of overheated houses may be another. Both pulmonary and bone tuberculosis are widespread and undoubtedly have been greatly increased by war conditions. There are no institutions for caring for the sufferers and the disease generally runs a rapid course. Although the climate, by reason of the dry atmosphere and the



FIG. 1. Sketch map of Asiatic Turkey and adjacent countries. Aleppo relief district is enclosed heavy broken line. The direction of the deportation in 1915 and of the interrupted return of the survivors in 1919-1920 are shown by arrows. Approximated boundaries of the present Armenian Republic (checked area) and of the proposed New Armenia as outlined by President Wilson, are roughly indicated.



FIG. 2 Turkish barracks, Aleppo, converted into a Refugee Camp. Photograph taken in late summer afternoon shows refugees preparing beds for sleep in open courtyard



FIG. 3 Typical narrow city street (Aleppo) from which the adjacent stone buildings exclude the sunlight



FIG. 4. Arab village made up of "bee hive" houses with little provision for light or ventilation



FIG. 5. Refugee children, filthy, ragged and vermin-infested, arriving in Aleppo from the Mesopotamian desert.

long rainless season may be regarded as favorable in the treatment of the disease, the present living conditions of the people are such that the spread of the infection is likely to continue until these conditions are improved.

Venereal Infection.—Venereal disease was exceedingly common among both Armenian refugees and resident Arabs² and Turks. There was much syphilis as well as gonorrhoea. Neosalvarsan was exhibited in all the drug shop windows and not infrequently a patient presented himself at a physician's office bringing both the diagnosis and the necessary medicament, asking only that the doctor administer the drug. It may be of interest to note in this connection that neosalvarsan could be purchased in Aleppo in 1918-1919 more cheaply than in New York owing to the fact that a large supply had been brought in during the German occupation. There were no official statistics of any kind relative to the incidence of venereal disease among the general population, but competent and observing native physicians were certain that the war had brought a great increase, particularly in the refugee element. One physician had made a special investigation of the question among the Armenian population, selecting certain villages for particular study. On the basis of his observation, the following figures were submitted:

	Before war	After war	Increase
Gonorrhoea:			
In country	0 4-1 0 per cent	20 per cent	20 times or more
In cities	2-10 per cent	40 per cent	4 times or more
Syphilis:			
In country	0 2-1 0 per cent	10 per cent	10 times or more
In cities	5 0 per cent	25 per cent	5 times or more

These figures indicate in the first place a remarkably low incidence of venereal disease among the *village* people in pre-war times. Confirmatory evidence of this was obtained from other sources. A physician practicing in an Armenian town of 5,000 people near Antioch, told me that venereal disease was practically unknown there before the war and that in 1910 two young men who acquired syphilis on a visit to Alexandretta

² Among the Bedouin Arabs, who periodically visit the bazaars in the larger cities, syphilis is very common. Many show lip chancers which are most probably contracted in the course of coffee drinking. The beverage, a bitter concoction, is served in small amounts in tiny cups of which the host usually has only one or two. The guests, which may number ten, twenty or thirty, drink in turn from the cup which is repeatedly refilled without washing. Since coffee is often served in this fashion a dozen times in the course of an evening, the opportunity for indirect mouth to mouth infection would seem to be excellent.

Medical quacks who flourish among the ignorant Arabs recognize the virtue of mercury in treating syphilis but their methods of administering the drug may invite criticism. It is a common practise to expose the patient to mercury vapor by having him sit in a small tent covering a charcoal brazier into the hot coals of which a quantity of calomel powder is thrown. Three treatments are given on successive days during which time the patient is kept fasting. A severe mercurial stomatitis not infrequently results.

were banished from the town, the physicians of the place, interesting to relate, taking an active part in the expulsion. It may be of interest to add that the entire population of the district was deported in 1915, and among the survivors who returned in 1919, the same physicians observed many cases of syphilis and gonorrhea. In this instance the increase in venereal disease was certainly greater even than is suggested by the figures in the above table. Normally these village people lead a very simple moral life with little contact with the outside world. The rare instances of venereal infection were generally the result of visits to Aleppo or one of the coast cities. Recognizing this fact, a missionary physician practicing in one of the interior Turkish towns stated that in suspicious cases, instead of asking the patient when he had acquired the infection, the information was better obtained by inquiring as to when he had been to Aleppo. The War upset the simple life of these country people. It brought first the conscription of the younger men into the army or labor corps, an environment hardly conducive to chastity. (A Turkish medical officer reported that among 1,200 soldiers at one post, he found just after the Armistice an incidence of venereal disease of 46 per cent.) Then came the deportations, with its hardships and temptations, particularly for the women. Many were violated and numbers of girls were sold into the harems or public houses. In the light of these circumstances, it is hardly surprising that venereal infection, seen only occasionally in pre-war days, should have been so widespread, among the post-war survivors. Indeed, the percentage of infection among the Armenians girls and women recovered from the Arabs and Turks was smaller than we had expected to find it. In Aleppo, for example, where more than 800 were rescued from Arab homes, an examination of vaginal smears showed gonococci in 8 per cent, while at one of the sub-stations, where a similar number of girls were taken from the Turks, the incidence of gonorrhea was still lower. In the Aleppo group, there was clinical evidence of syphilis in approximately 5 per cent. It should be remarked that while practically all of these girls had been sold into a form of slavery, many had been well cared for and had lived in harems, where the chance of infection was far less than in the case of many refugee women who were for several years without a home of any kind. Of the girls recovered from public houses in Aleppo, a high per cent were infected.

Prostitution in Aleppo, it might be explained in this connection, is recognized by law and there is a certain degree of surveillance of the women by the police department. The women are required to appear periodically for examination by health officers appointed for the purpose and those found infected are required to take a course of treatment

in a municipal venereal hospital. The hospital has a capacity of 100 beds, and the writer was told that the institution was always full. This was certainly the case when he visited it. It is an interesting fact that the women, though compelled to go to the hospital, are required to pay for their keep while there, first, second and third class accommodations being provided. The penalty of refusal is the loss of right to ply the trade. Through this arrangement, the cost to the city is small, but whether the results justify even the small expenditure required, is very doubtful.

Miscellaneous Conditions.—Of the large disease groups, such as malignant tumors, chronic heart and kidney disease, arteriosclerosis, no definite statements can be made, either as to incidence among the Armenian refugees or even in the fixed Arab and Turkish population. We did see a number of examples of each, but the writer is not certain that any of these conditions is more common than in the United States.

Among surgical conditions, the rarity of appendicitis noted by previous medical observers in Turkey, we were able to confirm. There were many cases of hernia, referable no doubt to the custom of carrying exceedingly heavy burdens on the back and thus putting a severe strain on the abdominal muscles.¹⁰ Bladder stones were frequent, though not nearly so common as in certain parts of the Far East. Following the renewal of hostilities in 1920, between French and Turks, in which Armenians were embroiled, there was much war surgery, which in most respects was no different from that seen in France, except possibly for the larger percentage of wounds inflicted in hand to hand fighting. In the treatment of infected wounds, the Carrel-Dakin method was used with excellent results. Portable chlorinating outfits had fortunately been included in the hospital equipment taken over, thus rendering the accurate preparation of the solutions a simple matter. There were many cases of cold gangrene, particularly at Marash, our most northern station in the foothills of the Taurus, where in the severe winter of 1919-1920, there was much fighting at the worst part of the season. Tetanus was a common complication in all forms of injury.

SUMMARY AND CONCLUSIONS

The physical condition of the several hundred thousand Armenian refugees in Southern Turkey and Syria, who started back to their homes in Asia Minor after the armistice, was in certain respects very pitiable. Eye and skin infections were rampant, and venereal disease widespread. Tuberculosis, common in prewar times, was markedly

¹⁰ The professional burden-bearer ("hamal") will carry without a murmur 250 to 300 pounds, and if a bonus is offered, considerably more.

increased. But being the remnant of perhaps a million exiles, these survivors were, no doubt, physically the fittest of the deported, and on the whole gave evidence of their hardiness and relative immunity to certain of the communicable diseases. Few of the halt, lame, and blind had survived, and the leper, a common sight in certain parts of the country before the war, had practically disappeared, one of the few contributions of the war to the general good.

The repatriation of these people, their temporary support, provision for sick and orphans, rescue of women and children taken by Turks and Arabs during the war, were among the problems confronting the Allied forces of occupation, British and French, and American relief agencies, when hostilities ended. In the occupied zone this complicated work was carried on jointly by the military administration and the Near East Relief, while in the unoccupied territory the burden was assumed by the latter organization alone.

The emergency phase of this relief work should logically have ended in the spring of 1920. Central and Southern Asia Minor, to which the refugees were returning, being essentially an agricultural country, suffered no great material damage from the war, and while a majority of the Armenians had lost their homes and goods, they could have become, through their characteristic energy and resourcefulness, entirely self-supporting in a short time, had the opportunity been afforded them. But the renewal of hostilities between Nationalist Turks and Allied forces of occupation, early in 1920, soon resulted in conditions, as respects the Armenian refugee, worse even than during the war, and rendering fruitless much of the constructive work that had been done. It is quite clear that the only hope of permanent rehabilitation of these homeless people lies in the establishment of a stable and just government that will guarantee to all, peace, security, and freedom of opportunity. Until this change comes, little can be expected in the way of improvement of the present living conditions to which the prevalence of many of the existing diseases is largely or solely referable.



PERFORATING WOUNDS OF THE EYE. THE USE OF CONJUNCTIVAL FLAPS. FIRST AID IN BATTLE INJURIES OF THE EYE. INDICATIONS FOR REMOVAL OF AN EYE¹

BY MAJ. HARRY VANDERBILT WÜRDEMANN
M. R. C., U. S. A.

THE PATHOLOGY, COURSE AND TREATMENT OF PERFORATING WOUNDS

Definition: *Perforating wounds of the eye* may be defined as those which completely penetrate all its layers without the retention of a foreign body therein or within the eyeball. Perforating wounds of the cornea are often complicated by prolapse of the iris and, if the cut extends sufficiently deep, as it commonly does, injury to the lens capsule or lens, or often of deeper structures, complicates the trauma. If septic, to the dangers of the wound itself may be added hypopion keratitis, iritis, infection of the other portions of the eye and resultant panophthalmitis. Wounds of the sclero-corneal margin are specially dangerous on account of injuries to the ciliary body with subsequent sympathetic irritation or inflammation in the other eye and of the tendency of the iris to prolapse with posterior synechia. It is safe to say that wounds of the cornea, *per se*, and limited to this structure, seldom give rise to sympathetic inflammation or irritation. These injuries are always emergency cases and in civilian practice, should the general practitioner, in whose hands they commonly first fall, not feel that his training and experience have thoroughly prepared him to treat them, he should at once refer to such of his colleagues as he feels can do justice to such cases. The Army Surgeon, unless on special duty, is expected to attend to any and all kinds of cases.

ETIOLOGY

Incised and punctured wounds are more often seen; lacerated and contused wounds more seldom; most of such cases being complicated by injury to the iris, lens and ciliary body. As a rule, the eye has had ample opportunity to become infected before examination by the eye surgeon and, where such occurs, the infection is almost invariably communicated by the working man from his fingers or dirty handkerchief or by ill-considered operative procedures by fellow workmen in the factory or even by physicians. The *objects producing such injury* are manifold and at times bizarre. Perhaps in family practice little children are the most common patients, having injured themselves by pen-knives, forks, needles, and hatpins. On the farms the act of splitting fire wood; and in the trades metal fragments, wire, nails, breaking bottles and water gauges. Shot grain wounds generally penetrate.

¹Lecture 3 to class of Army Medical School, Washington, D. C., May, 1921.

The same is to be said of shrapnel wounds. In perforating wounds of the cornea,—*prolapse of the iris* into the wound is an attempt by nature to avoid infection. Also the effort on the part of the iris is a suicidal attempt, for this structure becomes pinched and sooner or later gives rise to irritation, causing irido-cyclitis and sympathetic ophthalmitis. By walling off the infected sides of the incision an effort is made to ward off the entrance of bacteria into the anterior chamber and to avoid subsequent panophthalmitis. Beyond this purely mechanical action the blood vessels of the iris assist in carrying off the localized infection to the general circulation, thus preventing subsequent necrosis of the cornea. A second feature, noted by the presentation of the iris, is that the process of actual healing or of granulation tissue formation is materially assisted; that after draining away the infected agencies the number of leucocytes supplied by the blood vessels of the iris readily assist in the formation of new connective tissue elements. This tends to permanently close the perforation and allows the reformation of the protective epithelial strata of the cornea. Besides completely filling the gap in the cornea and preventing any escape of the aqueous humor, the anterior chamber is restored and the intraocular circulation re-established. It cannot be denied that many lamentable results are avoided by performing an iridectomy, or by releasing the anterior synechia. The author does not advocate nature's method as being superior to surgical interference, but presents it as the means Nature adopts for closing a hole in the cornea in a most effectual manner.

SYMPTOMS

As a rule, perforating injuries cause severe pain, burning, lacerimation, photophobia and immediate blindness. There is ciliary congestion and commonly edema of the lids and conjunctiva. Examination shows a more or less wide open wound involving all the corneal layers. If existent more than a day, its edges are macerated, the anterior chamber empty, the iris prolapsed and perhaps impacted in the wound, the pupil drawn to one side, and if the lens be injured, whitish and not allowing of examinations of the fundus by the ophthalmoscope. It is well to ascertain not only the apparent character of the wound, but also the instrument causing it and the direction from which the cut or wound came, in order to judge of its depth and the amount of injury to the deeper structure of the eye, for it is almost needless to observe that probing of ocular wounds is, as a rule, to be discouraged. The edges of cuts, gashes and lacerations are at first sharply defined, but later the lips become swollen and the edges rounded. Proceeding from the wound into the cornea fine grayish stripes are seen. The various layers

may be separated so as to be readily distinguished. Sometimes the lips of the wound override but as a rule they gape. Simple uncomplicated injuries heal very readily, the cornea being soft and pliable and accommodating itself readily to the altered condition, the lips of the wound usually coming quickly together, union taking place within a few hours. Whiplash injuries often look like incised wounds. Punctures from needles are often so fine that they are with difficulty observed; under magnification the grayish canal of penetration will be seen in the cornea. Knife and scissor wounds and those made by other metal objects, are often large and flap-like, so much so that the lens escapes at the time of the accident and the vitreous is lost. In small wounds the iris comes forward and attaches to the posterior surfaces; in larger ones it prolapses. Vision varies from the normal in small lateral punctures of the cornea, with no loss of aqueous and no injury of other parts of the eye, to complete loss of light perception in case with great tissue destruction.

COURSE

All considerations regarding kind, size, location, complications, whether or not infected, nature of the wound, obtain in the course which we have already gone into in discussing abrasions and non-penetrating wounds. If a clean-cut penetrating wound of the eye by a clean and sharp instrument has occurred without any prolapse of the intraocular contents, the prognosis is generally good; such is the case in wounds involving incision of the cornea, as for iridectomy, cataract extraction and of the sclera for glaucoma. The edges of the wound usually coapt; there is some redness in the neighborhood, and under protection from the outer atmosphere the wound heals and the shape of the globe, together with the function of the organ, is usually preserved or restored; if the wound remains open, such as from delayed healing in cataract extraction, the chances for the entrance of pathogenic germs and consequent inflammation are greater.

DIAGNOSIS

The opened eyeball; the lower tension; the shallowness of the anterior chamber; and perhaps extrusion of a portion of the iris; together with the history and symptoms speak for the character of the injury. The determination as to whether or not a foreign body has passed or remains in the eyeball, should always be made.

PROGNOSIS

This depends upon the size and the seat of the injury. In seriousness these injuries range from the smallest perforation by an aseptic needle, producing no destruction of tissue, without complications, and which permanently heal in a few hours, to those of great tissue destruc-

tion and injury of many parts of the eye, with immediate and permanent destruction of function. Also the small and innocent-looking puncture of the cornea with few immediate symptoms may be the channel through which a foreign body has entered, carrying with it the germs of a destructive inflammation, hence no penetrating wound of the cornea should be considered an insignificant affair, nor should an immediate favorable prognosis be given in any case. The condition of the union soon after the accident should not be used as a positive guide in prognosis. The larger the wound the more the consequent cicatricial opacity and distortion of the shape of the globe following the healing and the worse the resultant vision.

COMPLICATIONS

Aside from injuries to the iris, lens, ciliary body and deeper structures of the eye and the entrance of infection with its consequences, others occur in the course of the healing.

MEDICINAL TREATMENT

In treating these cases the first and probably most important point is to clean not only the wound, but also the entire conjunctival membrane, along with the lids and adjacent tissues. Strong antiseptic solutions are not advisable for the conjunctival surface, as they usually increase the pain, redness and swelling. I prefer a thorough irrigation of these parts with a liberal amount of sterile water, or a solution of boric acid, using soap to cleanse the skin, followed by tincture of iodine. Fifty per cent argyrol solutions, even injected into the anterior chamber, have saved many of my cases, although apparently already infected, and I almost invariably use this as a dressing after injuries and operations. 1:3,000 sublimate ointment is applied to the lids and then an occlusive bandage, which must not be tight enough to press on and interfere with coaptation of the lips of the wound. The use of local or general anesthesia not only gives us an opportunity for thorough cleansing, but also for any surgical procedure that may be necessary, such as the removal of any accessible foreign body, replacing or excising prolapsed iris, removal of shreds of tissue and trimming the edges of the corneal wound when very rough and irregular. In small fresh wounds attempts may be made to replace the iris by a fine probe or David's spoon, and the use of atropine for a central perforation, (as a rule in all cases, for while eserine in marginal corneal wounds may be theoretically indicated, practically it has not fulfilled expectations.) Very small point like prolapses of the iris may be cauterized. After completing the toilet of the conjunctiva, iris and cornea, any wound of the lids should be sutured or otherwise treated as indicated. Closing

the corneal wound with sutures is usually a questionable procedure, as eyes needing corneal sutures are usually so badly damaged that they had better be enucleated. One to two sutures may be taken by very fine and sharp needles, care being used not to tie the threads too tightly so as to cause the lips of the wound to override.

CORNEAL SUTURE

The needle and suture with proper care are placed only through the external layers of the cornea, about 0.5 mm. from the edge and about half through, passing through the lamellae of the cornea. After pulling the edges of the wound together a square knot retains them in place for five to seven days, when the suture is snipped by the scissors and removed with forceps.

The Use of Conjunctival Flaps for Covering Perforating Wounds of the Eye.—Covering gaping wounds of the sclera and cornea by means of a conjunctival flap is essential to proper healing. The use of a sclero-conjunctival flap for all operations for cataract or upon the iris is advised by many authorities and such is my personal preference. Prevention of infection is thus secured by immediate closure of the wound and is essential where a chronic conjunctivitis or lacrimal suppuration has been present, even when the corneal wound is superficial. In penetrating wounds of the sclera after careful exploration and removal of impacted and extruded uvea, and snipping off the protruding vitreous, the sclera may be stitched by one or two interrupted sutures of catgut and then a conjunctival flap pulled down over the wound so that the cut sclera and cut conjunctiva be not in apposition.

In penetrating corneal wounds the procedure is more difficult, the character of the conjunctival flaps varying from single and double pedunculated or double flaps as above described, to the dissection of a large part or of all the conjunctiva at the limbus and connection of its cut edges by three or four interrupted stitches or a pouch-suture pulled tightly to completely cover the cornea. About five days after the corneal wound has sufficiently coapted the sutures may be cut and the conjunctiva allowed to retract to place at the limbus, where it heals, and in a couple of weeks no trace shows of its ever having been divided.

In complicated wounds of the anterior segment the prolapsed iris should be abscised and if the lens capsule be injured and the body of the lens be broken up the lens substance should be released and a careful toilet of the wound made.

In complicated wounds of the sclera the protruding uvea and vitreous must be cut off and the wound cleared of debris before the sclera is sutured.

Conjunctival Plastics for Defects of the Cornea.—Keratoplasty is best

accomplished by the use of the conjunctiva, especially in non-infected ulcerations which, when covered by conjunctival flaps, tend to rapidly heal and are not apt to be followed by perforation of the cornea. After thorough curettement and antiseptic chemical or electro-cauterization the defect is covered over by a single or double pedunculated conjunctival flap. *The single pedunculated flap* is made by dissecting the sclero-corneal conjunctival limbus about one-third around. Then the apex of the flap is cut broadly about 1 cm. wide and a cut made parallel upwards, forming a flap which is then laid carefully over the corneal defect, with or without suture, and a pressure bandage put over both eyes, remaining on two to four days. The pain disappears in two to five hours. If the first dressing be made in 24 hours the flap looks like a diphtheritic membrane, on the fifth day becoming intensely red, and in eight to ten days atrophying so that it appears as a diaphanous, thin membrane over the cornea, which speedily disappears, leaving the ulcerated surface healed.

With a *double peduncle* the limbus incision is curved about two-thirds of the way around the cornea and the flap brought straight over the corneal defect, the flap being as a rule attached to the limbus. In every case the raw surface left from the conjunctivo-plasty is permitted to heal spontaneously, which occurs by encroachment of the conjunctiva upon the surface, which covers the surface in about three days. *Two flaps* may be used for central defects, one with a single peduncle and the other two with bases, as shown in figure, forming a cross over the cornea. These are secured by stitches which are cut in five to seven days, when the flaps retract to their former places and heal thereon, or they may be held together in the center by a stitch, the under flap serving for a keratoplasty and the other for a flap.

1. For healing of ulcers Kuhnt has given this method an extensive trial, having used it 109 times in deep single ulcers, 67 times in perforating ulcers, 5 abscesses of the cornea and 237 ulcus serpens. For the covering over of prolapses, fistulae, and keratocele this method eliminates the danger of intra-ocular infection and prevents ectasiae.

2. *Old Prolapses of the Iris*.—It is well known that an infection of the globe resulting in loss of sight, or even of the organ, may occur as early as eight to fourteen days after an iris prolapse, and by secondary infection at any time during the life of the patient. These are best abscised and covered by a conjunctival flap. The operation is conducted by passing a narrow Graefe knife through and under the projection cutting through the cystoid cicatrix on one side, then abscising the flap by forceps and scissors or by using the Beer's knife for the same purpose. The true iris tissue is not to be drawn out, but the iridocorneal

projection smoothed off on a level with the cornea. Then a keratoplasty is formed by laying over this opening a conjunctival flap as before described. The author has often performed this operation with success. The reaction is not great. The after treatment is atropine 1 per cent in order to secure dilatation of the pupil; argyrol 50 per cent; oxycyanide of mercury 1:1000 or the white salve 1:300; or bichloride of mercury for antiseptic purposes. A binocular bandage is then applied and allowed to remain in place four or five days without changing; on the fourth or fifth day healing is found to have occurred, being completed on the twelfth day, when the conjunctival flap withers away. When the iris prolapse is fresh the conjunctival flap method is used as a protective dressing rather than keratoplasty.

(2) *Fistula of the Cornea*.—The danger to the lens of opacification, to the iris of prolapse, and to the globe of infection or atrophy and phthisis bulbi from a fistula of the cornea may be obviated by refreshing the edges of the ulcer and a double pedunculated keratoplasty done by the conjunctival flap method. Healing and permanent closure occurs in twelve to fourteen days.

(d) *Keratocoele* is to be treated by puncture with the point of a knife, excision by forceps and scissors, and a double pedunculated flap. Healing results in ten to twelve days.

(e) The operation is also recommended for incipient staphyloma of the cornea excising by the corneal trephine or burning the protruding scar tissue with a galvano cautery and then laying over it a conjunctival flap.

FIRST AID IN BATTLE WOUNDS OF THE EYES

1. Before cleansing or manipulating a recently injured, sensitive eye, lightly anesthetize it with from 2 to 3 drops of 4 per cent solution of cocaine, instilled at 3-minute intervals.

2. Cleanse the skin of the lids and the adjacent field by gently washing with soap and water, followed by benzine. (Benzol.)

3. Cleanse the conjunctival sac of loose foreign material by free irrigation with warm 3 per cent solution of boric acid, warm normal saline or warm 1-10,000 bichloride or oxycyanate of mercury, whichever may be available not forgetting that strong antiseptics may seriously damage the cornea.

4. Where foreign bodies are deeply imbedded in the cornea and where the whole cornea and conjunctiva are tattooed with indriven mud, fragments of stone or metal, the dangers of corneal perforation and infection are so great that such cases should be hurried to the nearest specialist center.

5. A wound of the eyeball, the gray-white change of a traumatic

cataract and effused blood in the anterior chamber, usually mean perforation of the eye by a foreign body. These cases demand the earliest possible specialized care and should be given precedence of way to the rear. The chances of infection of the globe through the open wound are so greatly lessened by promptly covering the wound with a flap of conjunctiva, that more eyes can be saved and more practical vision retained in such eyes by this than by any other single procedure. With corneal wounds a sufficient amount of adjacent conjunctiva is undermined and drawn down and held in place over the opening by simple conjunctival sutures of fine silk at each angle. If the laceration is considerable, but there are possibilities that some vision may be retained, the entire cornea may be thus covered and protected by undermining the conjunctiva throughout the whole circumference of the cornea and uniting it over the front of the globe.

6. Both eyes should be put at rest by full dilation of the pupils with 1 per cent atropine, a matter of much importance during rough transportation, and, unless contraindicated, both eyes should be lightly bandaged, using gauze, cotton and bandage material from within outwards. In few cases the tension of the eye, determined by palpating the globe between the index fingers, is high, and in this condition instillations of a 1 per cent solution of eserine are indicated, instead of atropine, until the pupil is very small.

7. Eyes which are suppurating from any cause should not be bandaged, but are to be washed out freely and frequently. Extension of the infection to the sound eye and to the eyes of others is to be guarded against.

8. Unless an eye is completely shattered, too early enucleation is not to be counseled. Sympathetic inflammation of the sound eye is almost unknown inside of two weeks after injury, and many eyes are blinded for the time being by intraocular hemorrhage which may clear in a few weeks or months and leave more or less useful vision. The decision in this matter of such importance is best made at the specialist center.

9. Inflamed and tender eyes with failing vision or without vision are best enucleated at once, because of the danger of sympathetic inflammation of the sound eye. The conjunctiva and the ocular muscles are spared as much as possible in order to form the best possible socket for an artificial eye.

10. Eyes that have been shattered are to be enucleated at once, with particular care to remove all fragments of bone, which are so commonly driven deeper into the orbital fat. By early operation, excessive cicatricial contraction is avoided and a far better bed formed for an artificial eye.

11. Fragments of missiles lodged in the orbital tissue are harmless, especially if they produce no evidence of irritation.

12. Defects in the lids should be repaired at once, lest cicatricial contraction makes a good operative result difficult or impossible to obtain.

13. Wounds of the eyes and orbit are no exceptions to the routine employment of antitetanic serum in military wounds.

14. The routine use of narcotics in injuries of the eyes is to be deplored, in view of the possibility of habituation. Small doses of paregoric or tincture of opium are usually sufficient.

15. The inclusion in the medical equipment of a focussing lens, a self-retaining lid retractor, an instrument of removing foreign bodies from the cornea, and of atropine, eserine and cocaine in the form of salts or solution, is essential for the adequate care of battle injuries of the eyes.

INDICATIONS FOR REMOVAL OF AN EYE

1. Eyes so diseased or injured that they have already excited sympathetic ophthalmitis, or eyes which contain malignant growths, should be enucleated.

2. Eyes in which a suppurative process has begun may be enucleated with safety, provided the process has not involved the surrounding orbital tissues or already begun to extend posteriorly so that it would be difficult to obtain an aseptic socket; otherwise evisceration is the safer operation.

3. Eyes so wounded that they are likely to excite sympathetic ophthalmitis should be enucleated, if two weeks or more have elapsed since the reception of the injury, because under these circumstances enucleation affords a greater security to the patient than any of its substitutes. If the eye is so injured that the sclera is extensively lacerated, enucleation is also indicated.

4. Eyes so wounded that they are likely to excite sympathetic ophthalmitis, if seen before two weeks have elapsed, need not be enucleated—that is, evisceration or Mules' operation may be performed, because, with perhaps the exception of a single case, there is no positive proof that these operations have of themselves excited sympathetic disease. They may fail to arrest the development of sympathetic ophthalmitis, just as enucleation may meet with a similar failure.

5. Staphylomatous eyeballs, especially when they occur in children, need not, in fact, should not, be enucleated. When uninflamed, they may be treated by the operation of abscission or complete keratectomy primarily with safety but it cannot be promised that subsequently, it may be for years afterward, the stump will not undergo calcareous or osseous change, which may excite sympathetic irritation in the other

eye and require enucleation. Staphylomatous eyes are suited to Mules' operation.

6. Eyes which are greatly shrunken (excessive phthisis bulbi) should be enucleated, as they do not lend themselves with safety either to evisceration or to Mules' operation.

7. Painful, blind, glaucomatous eyeballs, or eyeballs blind from chronic non-traumatic irido-cyclitis, may be treated by evisceration, with or without the insertion of an artificial vitreous, in the place of enucleation, with safety. They furnish one of the few indications for optico-ciliary neurotomy or neurectomy if enucleation or one of its substitutes should be refused by the patient.

8. Enucleation is preferable in very old patients, when the time element is important, and when the physical condition is such that the prolongation of convalescence is undesirable.

9. Evisceration as a substitute for enucleation is a safe operation and temporarily yields a stump which is better than the stump after ordinary simple enucleation. Subsequent shrinking of this stump, however, ultimately renders the cosmetic effect of the operation no better than ordinary enucleation, while its inconveniences are much greater.

10. The best cosmetic results among the substitutes for enucleation, if successful abscissions be excluded, are secured by Mules' operation, which is only positively contra-indicated by malignant disease, sympathetic ophthalmitis, extensive laceration of the sclera and extreme phthisis bulbi. But it should be remembered that the primary excellent cosmetic effect of Mules' operation slowly lessens, owing to atrophy of the tissues of the orbit and sinking in of the artificial globe. This diminution in the volume of the stump is, however, much less marked than after simple evisceration.

11. Whenever a complete enucleation is performed, there is no objection to the implantation of a glass ball or a piece of sponge into Tenon's capsule, except perhaps after enucleation for sympathetic and malignant disease, but it is doubtful if the ultimate cosmetic advantage of the operation exceeds that of carefully performed enucleation.

12. There is no perfect substitute for enucleation and, necessarily, this operation must continue to be performed in many, if not the majority, of cases. When it is performed according to the rules of improved technic, which includes suture of the severed tendons to the conjunctiva, the cosmetic effect of the operation is, primarily, at least, as good as any of the substitutes, with the exception of Mules' operation and abscission, and is free from the objections which surround them. It seems likely that with further improvement in technic and particularly in the manufacture of artificial eyes, the cosmetic effect will be enhanced

and render less objectionable the operation of enucleation and less necessary the substitutes for it.

13. An enucleation which pays no attention to the preservation of the relationship between the conjunctiva, ocular tendons and capsule of Tenon, is a brutal operation which should not be performed unless the disease of the globe and surrounding orbit is of such a character as to render this precaution impossible.

The foregoing conclusions seem to be warranted by the statistical information gathered in this paper, although I fully realize that some of them will not be acceptable to all of the 117 surgeons who have contributed their experience. For example: A number of operators undoubtedly reject conclusions 2 and 4, although they are in accord with the surgical beliefs of others. So too, the general sentence in conclusion 5 is in equally direct accord with the views of others. In other words, in these conclusions I have endeavored to epitomize the opinions which have been expressed by the various surgeons, although necessarily it was impossible to construct a series of deductions which would be equally acceptable to all contributors. Personally, they seem to me to represent a safe line of practice. In those cases in which complete enucleation is not demanded—and in my opinion they are in the minority—Mules' operation, when successful, certainly furnished admirable results, but I feel sure that although at the present time, from the cosmetic standpoint, it seems to be one of the best, if not the best, of the substitutes for enucleation, it is not likely to endure as an operative measure in ophthalmic surgery unless the percentage of failure is greatly reduced. I believe, as I have stated in conclusion 12, that improvement in the technic of performing the operation of enucleation and in the manufacture of artificial eyes will probably be so great in the future, that this and other substitutes for enucleation will seldom be required.

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EDITORIAL

SANFORD H. WADHAMS

Usually, alas, appreciation of service is posthumous. "Seven cities claimed Homer dead, through which, living, he begged his bread." It seems to be the fact that there must be a certain amount of sedimentation before the outstanding qualities of the individual, the bravery, the integrity, the brilliance which are his, come to be a matter of common knowledge and of public record. And this very quality of clarification often stretches out until the man who, "has deserved well of the Republic," as the Romans said, has gone to his ultimate reward quite unconscious of the esteem of his fellows.

And so, I was glad when Colonel Stark asked me to print the appreciation of Colonel Wadhams which follows this. Glad, because I know in an impersonal way, as so many others do, of the part he played in planning and carrying out with dogged, unremitting labor the heavy task which fell to his hands when the fields of France were harried by our foes.

I was glad also, because it had been my pleasure and privilege to be associated very closely with him in the uncertain days of 1916 and 1917 when as "benevolent neutrals" we strove together as members of "American Military Mission" in France. No one who worked with him in daily intimate relation could fail to be conscious of the keen analytic mind which drove straight for the heart of the matter in question; of the infinite patience, the dogged determination which would not let go until each necessary, ultimate detail had been dug out and set down for record. His ready, keen, Yankee humor, his kindly satire,

which never hurt, were always like a tonic when spirits were low and things seemed unusually difficult of accomplishment, and his sympathy for those distressed in mind or body was as spontaneous as it was genuine.

Yes, Colonel Stark, I am glad to print your appreciation and it is peculiarly gratifying to add to it, not as the "Editorial We," but as his personal friend, a tribute to the qualities which, as you say, are well known to so many.

JAMES ROBB CHURCH.

LEST WE FORGET!

On July 16, Lt. Col. Sanford H. Wadhams, Medical Corps, U. S. Army, was retired from active duty by reason of physical disability incident to the service.

Colonel Wadhams needs no introduction to the officers who served in France, for even those who were not privileged to know him personally were well aware of his achievements.

The words of Emerson, "If a man write a better book, etc.; the world will make a beaten path to his door," are singularly applicable to this gifted officer whose wise counsel was sought by many representatives of all branches of the service.

While the medical, and the majority of other officers in France, knew and fully appreciated his brilliant work in behalf of the sick and wounded, how many of the mothers, wives and sisters of both officers and men are aware of the debt of gratitude they owe Colonel Wadhams, whose unflinching wisdom and foresight and unflagging energy contributed more to the provisions for the care of the sick and wounded in France than the efforts of any other individual or group of individuals!

Always the personification of courtliness and kindness, and intensely loyal to his superiors and subordinates, he gave of his best to those of high or low degree alike, and his present physical condition is due in so small measure to the nerve-racking days and nights of the spring and summer of 1918, when, without thought of self, he labored beyond the call of duty.

The lack of public recognition of Colonel Wadhams' brilliant services to the American Expeditionary Forces will ever be an outstanding instance in the traditions of the Medical Department.

Whether public recognition comes later or not, he has the admiration and affection of a veritable host of friends, and these, together with the consciousness of a stupendous task successfully performed, will always be his.

A. N. STARK,

Colonel, Medical Corps, U. S. A.

COMMENT AND CRITICISM

PSYCHOLOGY AND PATHOLOGY OF THE AUSTRIAN ARMY AVIATOR

This report is a compilation of the observations and medical data of the most prominent Austrian authorities, psychologists and neurologists, among others Prof. Dr. Hermann von Schroetter, member of the International Aeronautic Commission, and Prof. Dr. Wagner-Jauregg, Court Councillor.

To ascertain the requirements of the Austrian Air Service and to determine the qualifications of its personnel, it was necessary to study conditions at the front. Visits and observation trips by leading Army medical men to the "flights" at the various fronts were therefore instituted in the Austrian Army. It was found that the physical and mental functions of the Austrian air-man were affected by the change from the normal soldiers routine, the difference in geographical location and even by the peculiarities of the starting field. Further by the varying climatic conditions, by nutrition and accommodation of personnel and aeroplanes and even by the personal qualifications of the commander and the other officers of the section. All these factors enter before the air weapon is taken into account. These components together are the genetic causes of the strange phenomena known as the "personal tint," more or less marked in every aviation company and never found in the other branches of the army. This phenomenon gives an excellent insight into the different needs and necessities of the air service and by means of comparison renders possible the selection and application of an improved organization.

By the empirical method of proceeding, it was also possible to obtain data on the phenomenon known as "being over-flown" ("Ueberflogensein") and the strange nervous troubles resulting from flying. Several high commanders of the Austrian Army complained of the unhygienic life, light-mindedness, carelessness and even lack of discipline found among airmen. It is undeniable that the conduct of the officers and men of the aviation service at the front was different from that of other troops, and that, in general, they were more difficult to handle. This fact is related to and caused by the aviators full consciousness of his being his own master in the air under all circumstances and in the feeling that he must depend on himself alone; furthermore, it is traceable to the perpetual mental tautness and concentration, due to constant and peculiar danger in which he is placed so that, in the Austrian Army,

airmen were classed halfway between "professed heroes and hysterical women."

However, the inspecting medical commissions found the circumstances much better than reported by various commanders. Airmen in combat sections were specially impressed with the desirability of leading a wholesome life, free from all sorts of debauchery. The value of sports and sufficient sleep were emphasized. All flying companies had bathing and other sanitary facilities where all sorts of gymnastic apparatus was put at their disposition and were used regularly by the officers and men. The main meal, without alcohol, was in the evening. Women played, no doubt, a great role in the mental life of the airmen. This fact is sufficiently illustrated by the typical suggestive, mural decorations of all aviator-dwellings; they were all in the sense of *Lex Neinze*, *Bayros* and others.

In order to fully appreciate all the qualities required of the airmen, it is very important to hear personally of the mishaps, combats, etc., on the front, as told by the pilot or observer himself. It would be of great interest for scientists and psychologists to read (or better still, if possible, to hear) the experiences of those who have been in combat. By classification of such reports it would be possible to select men possessing outstanding mental and physical qualities and to get a deep insight into the requirements of the air service. Such classification would bring out individuals particularly fit to serve as squadron and echelon commanders, because of their ability to emanate and transfer to subordinates an enormous potential energy. Not every airman is in full possession of himself under enemy fire. During the first combat flights in particular, certain mental suggestions and thoughts together with physical fright and even complete panic intrude to reduce the efficiency of the flight. Some fliers are in a sort of dream or nightmare; they shoot mechanically and only gradually grasp the situation sufficiently to act coolly. Some get rid of the oppressing and vexing tightness in the moment of danger, and are undisturbed by secondary sensations and perceptions; they act then with full presence of mind and are even able to contemplate upon matters not connected with the danger of the flight.

In the majority of accidents, it is not the aviator's own danger which effects his nerves and his will power; what unnerves a man is rather the burning machine crashing to earth, or the sight of death by a benzine fire of a comrade. Considering the demoralizing impressions of accidents involving terribly mutilated, burnt bodies, no more men than is absolutely necessary should be permitted to hurry to the scene of the accident. Periods of mental depression crop up in spite of

individual strong will power and iron nerves. The altered mental state manifests itself outwardly in an increased excitability, quarrelsomeness, outbursts of passion, lack of appetite, restless and perturbed ways, absence of mind, stammering or hasty speaking. In normal days these signs disappear. But long service at the front does not pass without leaving its mark upon the men. Minds and tempers formerly bright and glad change; the aviator becomes morose, petulant or self-contained, and is often "not to be recognized." Hours of increased tension make the man absent-minded, restless, low-spirited and melancholy, and bring on a gloomy apathy and a weak-minded timidity.

In the first and second year of the war, the air service, according to statements of a number of Austrian aviators, was a "down-right pleasure," especially on the vast plains on the Russian front; but since the use of incendiary and phosphorous munition was introduced and the combat tactics on the Italian front developed, it became "real hell." The described nervous attacks sometimes last a short time, but very often effect permanently the fitness of the men for air-service at the front. Recovery, however, often sets in if the flying is suspended for a period of several weeks. The disconcerting phantasy, born of fright, fades and the impressions of personal and comrade's success gets the upper hand. Zeal and self-confidence cure the psychasthenia. From the medical point of view it is possible, in some cases, to verify objectively determinable symptoms (detailed later on) of the nervous system and mind. In other cases it is not possible to find a sure indication that a mental "trauma" or a series of "traumas" has occurred. The "Flight-fatigue," "Fly-shyness," "Phobia atmospherique" (A. Babinsky) show themselves only through the already mentioned sensations of insecurity—the imperative feeling "I must go down." In order to fully and correctly evaluate the assertions of aviators it is necessary to know the previous history and personality of the aviator, and also to be informed as to his flying experience and accidents, if any. Furloughs are very necessary in order to keep the picked personnel in the best of conditions. During his leave, the aviator, should not be allowed to come near a flying field, or to act as teacher or technical officer. A complete change of environment is essential, and therefore a place should be chosen where the man neither sees nor hears anything of the air service, and it is not advisable to domicile airmen in a special aviators' recreation home. After having grasped the complicated mental life of pilots and observers, and taken into consideration the great variety of fluctuations in their psychic equilibrium, it will be seen that the "psychological examination" of candidates for the service is not of such great value as heretofore. Such an examination has merely the informative value of a preliminary examination.

The chief importance in the selection of air personnel must be laid on the structure and condition of the nervous system and on the previous individual and family history. The psychic disposition, the efficiency and ability of resolution, and the readiness of the will of the individual are not always equal. On certain days the individual feels he could perform difficult things with ease; on other days the same individual has imaginings and an increased disposition to frightened panic. In the laboratory tests, inferior men often behave quite otherwise than when in danger. It is evident that only through observation of the individual's actions at the helm by the flying instructor can a sure evaluation of the candidate's fitness be obtained, and not by a "psychological examination." Opinions differ as to the individualities and temperaments best fitted for aviation. Some consider as especially fit the calm, sober, prudent, reflective dispositions; others—and among these, the tried competent aviators—prefer the type that demonstrates a quickly reacting nervous system. A prerequisite is: complete control of the senses and the ability to concentrate the mind. The theoretical requirements of the air-men in Austria were the same as elsewhere. (M. Nepper, A. Gemelli, G. Anderson, W. Moede.)

In order to get a result approaching as nearly as possible to the true psychologic reactions of a candidate, it would be of considerable value to give the "psychological examination" during a flight in an aeroplane. It would be easy to modify the present methods of examination (Burdon and others) so as to learn the degree of attention, diversion, faculty to concentrate, etc. By assigning tasks and problems for the candidate, solutions during the flight, it would be possible to "get his measure." The reaction and irritability due to fright would remain for laboratory examination. But even this method of examination would never give the candidate's true action and reaction, nor bring out his ability in the face of danger, as surely as would a combat or observation flight over a battle area. Would it not be better, therefore, after the candidate has taken one or two trial trips, to send him over the enemy's line in a known terrain and to wait for the result? Such a practical examination would increase the coordination of the nervous reflex system of the individual and would harden him against physical and mental disturbances. It is essential to keep a Medical Physical Record of every man. This record should accompany him from the time of entrance into the service to the end of it. All personal experiences, accidents the results of periodic medical examinations, the observations of his superiors should be registered thereon. The records thus obtained would give the basis for further research into the preparation and development of psychological examinations for air service candidates.

Night-blindness is undoubtedly a sufficient reason for exclusion from the air service. Persons with achromatopsy may be admitted if their sight is normal in other respects. Small defects of refraction also form no absolute reason for exclusion if the air-man has successfully served as observer. The air service requires men of strong respiratory organs capable of resisting increased air pressure. Latent tuberculosis or disposition to it, chronic bronchitis, emphysemas, anaemia, the different forms of psychastenia and previous wounds were considered cause for exclusion. Of great value is good, wholesome food. Indigestion and obesity restrict the capacity of the lungs and the alveolar tension and must therefore be avoided. Too much blood in the digestive apparatus after a hearty meal is also to be avoided, especially before a flight to a very high elevation. On the other hand, it is not enough to start out with only a cup of black coffee. Flying itself—presupposing perfect physical fitness—is not injurious to the health, if there is sufficient nutrition; it effects the physical and mental efficiency in the same manner as do all other out-door sports, and seems to have a favorable effect upon certain nervous disturbances by its stimulating influence upon the vital functions. But there is a difference between flying as a sport and flying at the front. The latter often is injurious to the organism as a whole, in consequence of the constant mental tautness, the many excitements and dangers, aside from the nervous disturbances which follow. The functions of the senses in the process of orientation in the air are not yet fully known, and it is necessary to analyse a series of experiments in order to settle the question.

Some persons are sensitive to quick change of position and acceleration² of speed and get sea-sick in spiral flights or in squally weather. Remarkable are the sensations when “falling through” an “air-hole” (a sphere of decreased barometric pressure which occurs in squally weather or in summer). These sensations are somewhat similar to the feeling experienced on the bow of a steamer in a heavy sea or during the first moment of a downward starting elevator. The air-man’s auditory organ is strongly affected by the noise of the propeller and especially by the quick change of atmospheric pressure. Equalization of pressure sets in easier at the ascent than at the descent, and it is therefore desirable to accomplish the descent as gradually as possible. Especially where the inclination of the individual is toward catarrh of the throat or of the bronchial tubes, it is best not to expose the auditory organ to unnecessary irritation. Constant and accurate observation is an important factor for the observer and pilot, who must search uninterruptedly the sky with its changing light and cloud effects. It is necessary to protect the eye from the disadvantageous effects of strong

radiation and the harmful influences of draughts (convulsions of the eye-muscles, conjunctivitis.) Pilots, after a few months of flying, complain of a falling off of the strength of the vision, and the illusions at flights in high elevation. Sometimes horizontal Nystagm and Scotomes were found upon examination. The Scotomes usually have a circular form and are localised between 35 and 50 degrees; they were traceable in 50 per cent of the men with long air service. It is remarkable, that the men were not conscious of the defect (with one exception only). The use of colored goggles cures the disease in a few weeks. It is not yet ascertained whether the electric state of the atmosphere—especially the Ironization—influence the organism as does the increasing intensity of ultra-violet light at the ascent. For the solution of this question, it is essential to know whether the penetrating Gamma rays do not diminish with the elevation, as supposed till now. On the contrary, these rays increase in intensity at a level above 3,000 meters, reaching as high as 24 Iones per cubic meter. At high levels or in great cold, air-men often show an increased dysury (strangury), which is a symptom of nervous exhaustion. Fluctuation of the degree of moisture in the air and the aridity in high altitudes, influences the skin and mucous membranes. Weak heart is a great obstacle for aviation candidates and blood pressure of 60 mm. is a sure disqualifier. Repetition of irritation and depression not only cause temporary neurasthenia, but also lasting exhaustion of the neuro-muscular-reflex system. The nervous strain on the whole constitution influence the heart, especially if that organ is an inferior one which has been weakened by previous illness, or if there exists Thyreoidism, or if the individual is lymphatic. Such conditions develop into heart neurosis and vasometric disturbances. Aviators who complained of Insomnia, palpitation of the heart, oppressive feeling and Kardialgy showed kardi vascular hyperexcitability, striking lability of the heart beats during emotional moments, respiratoric Arrhythmia and similar symptoms, but no marks of influence upon the heart regulation and especially no Extrasystoles as are to be found in connection with pure sensogen influences.

The above mentioned disturbances of the heart, arising from mere psychic injuries, show distinctly their connection to mental traumas, as all persons who were examined along these lines never complained of troubles of the nerves or heart. It is therefore to be assumed that the increased claims on the mental life operate in an accumulative manner by reflex process upon the heart and its rhythm. The result of physical and mental over-exertion sometimes remains limited to the psychis and finds its vent in an irritable weakness or dejection without producing any hyperkineses or affection of the heart. The individual's

constitution, ancestry, temperament and disposition must be taken into account and can be checked up from the above. "Over-flown" or "tly-shy" pilots generally complain of the following: Decline of the ability of orientation and equilibrium in the air; fluttering of the eyelids, diverse Paraesthesias, hypersensibility of the skin (Dermography); hyper-trophic reflexes; Tremor; striking lability of the pulse; Tachykardy; mental irritability; quarrelsomeness, morose temper, headaches and insomnia. Professed "tremblers" or men with functional paralysis have not been seen among aviators. In regard to the determination of the injuries caused by aviation, it must be said that neurosis originally arises from a traumatic endogen base, from variation of the stricture in the central nervous system (Haemorrhagies), or from similar causes. On the other hand, a number of cases of neurosis have arisen from purely psychogen and exogen causes. Finally, it is possible for symptoms to arise caused by a combination of the two above described sources, such as the case, where a previous organic change caused a peculiar mental disturbance with symptoms of an ostensible functional character. A derogatory influence is always to be imputed to excessive use of black coffee, alcohol and cigarettes.

PEKING UNION MEDICAL COLLEGE

Plans were announced today for the dedication of the new buildings of the Peking Union Medical College, erected by the China Medical Board of the Rockefeller Foundation. The ceremonies will fill the week from September 15 to September 22 and will include an international medical conference to which scientists from America and European countries as well as from the Far East have been invited. At the time will also occur the inauguration of the Director of the College, Dr. Henry S. Houghton, and regular sessions of the institution's Board of Trustees which is composed of representatives of the Rockefeller Foundation and of six missionary societies which had maintained an earlier medical college in Peking.

In preparation for the meetings and conferences the Secretary of the Foundation, Mr. Edwin R. Embree, who serves as executive officer of the Board of Trustees of the College, sails for China leaving New York, June 22. The following members of the Board of Trustees will sail during the summer and be in Peking for the meetings:

Dr. George E. Vincent, President of the Rockefeller Foundation.

Dr. Paul Monroe, Chairman of the Board of Trustees.

Mr. John D. Rockefeller, Jr.

Mr. Martin A. Ryerson, of Chicago.

Dr. William H. Welch, of Johns Hopkins University.

Mr. J. Oriol Armitage, of the Society for the Propagation of the Gospel in Foreign Parts, England.

Mr. James L. Barton of Boston, Secretary of the American Board of Commissioners for Foreign Missions.

Mr. F. H. Hawkins, of the London Missionary Society, England.

Mr. J. Christie Reid, of the Medical Missionary Association of London, England.

The following medical scientists from the Western Hemisphere have accepted invitations and will be present to take part in the international medical conference:

Dr. William H. Welch, Johns Hopkins University.

Professor Tuffier, of Paris.

Dr. A. B. Macallum, McGill University, Montreal, Canada.

Sir William Smyly of Dublin.

Dr. R. T. Leiper, London School of Tropical Medicine.

Dr. Francis W. Peabody, Harvard University Medical School.

Dr. George de Schweinitz, University of Pennsylvania.

Dr. Florence Sabin, Johns Hopkins University.

Dr. S. S. Goldwater, Mt. Sinai Hospital, New York.

Dr. Thomas Cochrane of London.

Dr. J. G. Clark, University of Pennsylvania.

Dr. Victor G. Heiser, International Health Board.

Dr. Richard M. Pearce, Rockefeller Foundation.

The Peking Union Medical College, situated in the capital of the Chinese republic, had its beginning in an earlier institution, the Union Medical College, founded in 1906 by the joint efforts of six British and American missionary societies. The property of the earlier school was transferred in 1916 to the China Medical Board of the Rockefeller Foundation, which has purchased additional land and erected, in an interesting adaptation of classic Chinese architecture, a series of hospital and laboratory buildings. The institution comprises not only the medical school, but also a two hundred and fifty bed hospital with out-patient clinics, a nurse training school, and a premedical school—an institution of junior college grade with a distinct faculty and group of laboratory and classroom buildings.

NEW EDITOR FOR THE MARINE CORPS GAZETTE

The Board of Control of the Marine Corps Association, composed of Maj. Gen. Commandant John A. Lejeune, Maj. Gen. Wendell C. Neville, and Brig. Gen. George Richards, announce the relief of Maj. Edward W. Sturdevant as Secretary-Treasurer of the Association and Editor of *The Marine Corps Gazette*, by Maj. Edwin N. McClellan.

Major Sturdevant has been Editor of *The Marine Corps Gazette* for about three years, and under his control, the *Gazette* has had an extremely successful administration, and membership in the Association and subscribers to the *Gazette* has greatly increased. After an extended leave of absence Major Sturdevant will report to the Marine Barracks, U. S. Naval Torpedo Station, Newport, Rhode Island, as commanding officer.

Major McClellan will carry on his new duties in addition to those as Officer-in-Charge of the Historical Section, and Insular and Foreign Affairs Section.

ANNOUNCEMENT

Treasury Department,
Bureau of the Public Health Service,
Washington, D. C., June 20, 1921.

The proposed Public Health institute which the Service contemplated holding in Washington, D. C., during the fall of 1921, has been indefinitely postponed. This action has been decided upon after several conferences between officers of the Service and officers of the American Public Health Association.

The Fiftieth Annual Meeting of the American Public Health Association is to be held in New York City, November 14-18, 1921. Several other activities are planned by the Association in connection with their semi-centennial meeting in November, 1921, and it was at the request of the American Public Health Association that the Service institute for next fall was abandoned.

The Service hopes that it will be possible to arrange to hold a similar institute in Washington during the spring or fall of 1922.

By direction of the Surgeon General.

Respectfully,

C. C. PIERCE,
Assistant Surgeon General.



BOOK REVIEWS

THE MANAGEMENT OF MEN. A Handbook on the Systematic Development of Morale and the Control of Human Behavior. By Edward L. Munson, Col. General Staff (Med. Corps); Chief, Morale Branch, War Plans Division. (Lately Brigadier General, General Staff). Prepared with the assistance of Arthur H. Miller, Major, Coast Artillery Corps. Henry Holt and Company, New York, 1921.

In 1917 Colonel Munson wrote of Morale. "It is a 'no-man's land' into which neither line nor staff penetrate." After that, recognizing the necessity for exploration of this unknown territory he took up the study of the subject and proving the value of morale as a real offensive part of tactics brought it to systematic adoption as a weapon for the army. Even a casual familiarity with the demoralization of troops through enemy propaganda brings a realization of the power of this method of attack. It was very evident in the Italian forces and perhaps equally so with the Germans in the latter part of the war when the allied powers made so strong an assault on minds which were already fatigued with many months of conflict.

Recognizing its place as a means of aiding in the defeat of an enemy, naturally demonstrates its necessity also as a defensive factor in the building up of the spirit—tone, of one's own forces in order that they may be immune, so far as possible to assaults of this character.

We have been accustomed to think of the question of Morale as rather an abstruse one, somewhat akin to Metaphysics or higher Psychology and not as something which can be reduced to more or less practical lines and demonstrated by charts and diagrams. It is this which Colonel Munson does in his work. He shows that given a certain condition there can be found for it a definite cause if proper and intelligent search be made for it; that certain consequences are the practically inevitable results of certain faulty circumstances. It is interesting and instructive to follow his reasoning along this line and the examples which he cites are quite convincing. This last war has given an impetus to many things in civil life which were supposed to need no help nor instruction from the military. This analysis of morale and the management of men is certainly one of them. The governing and direction of any large body of men must assimilate many of the features of control which pertain in the military force. A contented, satisfied factory, contracting camp, store, is a much more profitable investment than one in which all concerned are pulling at cross purposes. And that is one of the things which he purposes to show and does show. While primarily intended for the man of arms, there is a great deal in Colonel Munson's book which is very apt for civil life and any man who has large forces under his direction will profit from a serious consideration of what Colonel Munson has written. There are chapters on the general principle of morale control, general psychological principles, the basic instincts, psychological qualities, relations and methods, the human agents of morale control, civilian factors affecting morale, mechanics of military morale, functioning of the morale organization, some elements of leadership, education, information and training, recreation, the recruit, recruiting, re-enlistment and discharge, some special problems of personnel, health in relation to mental state, some factors of physical environment, reward, punishment and delinquency, industrial morale. There are also an index and many charts and illustrations. The book is compact in size and well gotten up.

SURGERY OF THE UPPER ABDOMEN, a new Modern Surgery of the Stomach, Duodenum, Gall-Bladder, Liver, Pancreas and Spleen, by John B. Deaver, M.D., Harton Professor of Surgery, University of Pennsylvania; and Astley P. C. Ashhurst, M.D., Associate in Surgery in the University of Pennsylvania. Second Edition, with nine colored plates and 198 other illustrations. P. Blakiston's Son & Co., 1012 Walnut Street, Philadelphia. Price \$14.00.

This one-volume edition of Deaver's "Surgery of the Upper Abdomen" is an improvement over the previous two-volume edition. The authors have been able to encompass between the covers of a not-too-heavy book, everything of importance discussed in the two volumes; important also is to be noted that enough non-essentials have been eliminated to allow of essential re-writing of certain chapters bringing them up-to-date with what progress has been made during the past seven or eight years. Some new material has been added in Surgical Technique. The voluminous literature which is available treating of the Surgery of the Upper Abdomen is rather appalling, and the many articles upon this subject which have appeared in the special and general medical journals of this and foreign countries during the past ten or more years, have not shown much real progress—certainly little or none in the study of the pathology either of the living or of the dead, except the proven facts that infections may occur from foci more or less remote from the chief symptom-producing pathology; these infections being conveyed through the general circulation or through the lymphatics. The recent experimental work of Sudler confirmed by Graham seems to add to the lymphatics a more important rôle as the infecting route in many of the diseases of the organs in the upper abdomen. As an example of the importance of this route of infection cholecystectomy is today preferred by some surgeons to cholecystostomy because of the frequent re-infection of the gall-bladder through the lymphatics of the liver—a vicious circle having been established—a complementary infection between the gall-bladder and liver taking place from time to time. Surgeons generally do not concede this route of re-infection the importance it deserves. Deaver throughout this book wisely calls especial attention to the lymphatic circulation as the more probable source of infections in many of the diseases he discusses. There has been progress in surgical technique, some of which has done something towards shortening convalescence. There has been little progress, however, towards reducing the mortality of surgical procedures except in certain clinics by a better discrimination in the selection of and in the giving of anesthetics. There has been an improvement in the after-treatment.

There is no surgeon in America or elsewhere more competent to write a book upon any subject in general surgery than is Doctor Deaver; his indefatigable energy, quick discernment of that which rings true in accordance with acquired scientific knowledge and its logical deductions, have placed his writings among the most sought by those seeking true information. When we add to what has just been written that Doctor Deaver is among the most, if not the most, experienced of operators at work today, it is unnecessary to say that a book of which he is the author contains the best that is known of the subject of which he writes, and may be consulted with the assurance that safe counsel is at hand. With Doctor Ashhurst as his coadjutor the senior author has produced a book which embodies all that is worth while knowing of the Surgery of the Upper Abdomen brought up-to-date.

JOHN E. SUMMERS, M.D.

CHIRURGIE DE GUERRE AT D'APRES GUERRE. By Auguste Broca, Professor of the Faculty of Medicine of Paris. One volume of 480 pages with 545 illustrations. Masson and Company, Editors, Paris. Price 25 francs net.

The distinguished author of this book is too modest. His more than thirty years of predilection in the bedside and hospital study of the surgery of the bones and joints, and in addition more than three thousand wounded of this type of injuries having been under his care in the Great War, has given him a judgment worthy of the highest respect and appreciation. Professor Broca need not apprehend that he will be accused of "inventing neither a technique nor a method." True, as he says, this type of surgery does not bring forth echoes which permit the blowing of the trumpet of fame.

The book begins with an introduction in which the general organization of the Services is discussed. It is then divided into two parts: First, that of Urgent Surgery, comprising eight chapters in which are discussed mortality, statistics, evacuations, form and treatment of general and local infections, lesions of arterial trunks, foreign bodies, fractures and wounds of bone. Part 2, After War, discusses vicious callous, true ankylosis, stiff joints or false ankylosis, cicatrices or muscular affections, prolonged traumatic osteomyelitis, prothesis of amputations and reeducation of the mutilated. This second part of the book, that which most interests the civil surgeon, is of very practical value in every-day work, and the advice given by this distinguished surgeon in the management of so many of the post-traumatic lesions with which we have to deal, especially in hospital practice, is of value to the young surgeon as well as to the older man. It is based upon progressive modern medical and surgical knowledge tempered with the rich experience of many years. Broca's "Surgery of War and After War" is a worth-while monograph in any surgeon's working library.

JOHN E. SUMMERS, M.D.

A MANUAL OF SURGERY, for Students and Physicians. By Francis T. Stewart, M.D., formerly Professor of Clinical Surgery, Jefferson Medical College; Surgeon to the Pennsylvania Hospital. Fifth Edition, one volume of 1024 pages, with 590 illustrations. P. Blakiston's Son & Co., 1012 Walnut Street, Philadelphia. Price \$10.00 net.

As a manual of surgery this posthumous edition of "Stewart's Surgery" will compare favorably with any other manual with which the writer is familiar. The popularity of the earlier editions was a result of the ability of the author to present his subject in an orderly manner, and in a way to convince the reader of the reliability of what he stated. As in former editions there is no padding in this one, hence for the medical student and physician it is a fine text-book and book of reference. Dr. Walter Estell Lee, who was associated with Doctor Stewart for many years, has incorporated in the book his military experiences in such a way that the knowledge gained may be applied in every-day surgical practice. The author himself re-wrote much of the text of this last edition in order to keep abreast with what his keen judgment considered dependable progress. It is a fortunate thing that this unusually able surgeon's manual is being carried on by colleagues whose capability is evidenced in this Fifth Edition.

JOHN E. SUMMERS, M.D.

GYNECOLOGY. By Bronke M. Anspach, M.D., Associate in Gynecology, University of Pennsylvania. With an Introduction by John G. Clark. One volume of 726 pages with 526 illustrations. J. B. Lippincott Company, Philadelphia and London. Price, cloth, \$9.00.

The field of Gynecology would appear to be so well covered in books upon this specialty that a new book at this time seems without demand. This, however, is a

new kind of a book, treating of the diseases peculiar to women, from a source always representative of the best in Surgery and Medicine, The University of Pennsylvania. From the days of Doctor Goodell until now no gynecological clinic in the country has been more respected because the responsible leaders and assistants have been men in whom the profession placed strict confidence. Doctor Anspach for many years has been one of these men and his Gynecology is an exposition representative of the Gynecological Department of the University of Pennsylvania. The book is dedicated to Dr. John G. Clark, head of the Department, and this gentleman writes the Introduction which in itself is a review of the book. Writing first in general terms, Doctor Clark says, "From the chapters on Embryology, Developmental Anomalies, Anatomy, and Physiology the reader is carried logically forward into the intricacies of anamnesis, physical examination, and laboratory investigations, these chapters being so closely correlated as to develop the deductive powers of the student, making of him a well-poised diagnostician, rather than the slave of a memorized symptomatology that, when the atypical case is encountered, inevitably leads him into a quagmire of doubt. When the chapters on the practice of gynecology are reached, all the capital procedures that have found a stable setting in practice are considered, and usually more than one method is offered for the reader's selection." The writer has gone over this book carefully and believes that in it the student, physician and also the general surgeon, as well as that, nowadays, *rara aris*, the pure gynecologist, will find what is known about any particular subject in gynecology, or references to it may be found in the dependable bibliographies after each chapter.

He will get good advice as to treatment; he will learn that perhaps it will be wiser in the future to hold his hand where he has in the past been accustomed to operate.

The numerous illustrations are well executed and add great value to the text.

Doctor Anspach has recently accepted the Chair of Gynecology in Jefferson Medical College made vacant by the retirement of Doctor Montgomery.

JOHN E. SUMMERS, M.D.

THE SURGICAL CLINICS OF NORTH AMERICA. Issued serially, every other month (six numbers per volume); octavo; illustrated. Volume I, Numbers I and II. W. B. Saunders Company, Philadelphia and London. Cloth, \$16.00.

The Surgical Clinics of North America, the new venture succeeding the Surgical Clinics of Chicago, opens with the Philadelphia number. Doctor W. W. Keen very appropriately writes the Introduction. He calls attention to the fact that Surgical Clinics were first held in Philadelphia, in the Jefferson, the University, and the old Pennsylvania Hospital, all poorly equipped at that time. Doctor Keen says (referring to the general practitioner) that he is "Hampered too often by the necessity of constant and continuous practice for the support of his family; instead of his going to the clinic, in this and the succeeding volumes the clinic will come to him, with but little expense in money and almost none in time. He will learn the latest means of diagnosis, sometimes requiring instruments and skill beyond his means and his knowledge (e.g., the cardiograph or technical chemical tests). But even then his horizon will be enlarged, and he will know where and from whom he can get help if need be. Moreover, these lectures will disclose means and methods which he can use or can learn." Doctor Keen further makes the time-worn plea for the adoption of the Metric System. He makes a second plea for "every author to use the purest and best English style."

The first Clinic is by Dr. John B. Deaver, on Pancreatitis. This is not a clinical lecture in the sense that one is usually led to expect from the type of publication under

consideration, but is a short monograph of thirty-five pages. That it is a good paper goes without saying, and no one in America is equally as able to discuss this important subject from the standpoint of experience as is the author. There are nine other Clinics, all of a high order, and contributed by clinical teachers of wide experience, A. P. C. Ashhurst, John C. DaCosta, John G. Clark, Chas. H. Frazier, John H. Gibbon, Chas. F. Nassau, T. Turner Thomas, John H. Jopson, and Geo. P. Muller.

The Clinics of the New York number are contributed by gentlemen, several of whom are quite as well known as are the contributors to the Philadelphia number, and their contributions are as worthy. The Clinics which impress the writer most are those by Dr. Willy Meyer, on "The Importance of Posture in Postoperative Treatment;" those of Chas. L. Gibson and Kenneth Johnson on "Pneumococcus Peritonitis;" that by Leo Buerger on "Some Complications of Urinary Lithiasis;" than by Doctor St. John on "Empyema."

One subject of a practical Clinic, the first, is jumbled and should have been more carefully edited. There is a tendency upon the part of some teachers to take too much for granted as to the amount of knowledge and experience their readers have; there is the less dangerous but rather tiresome practice of some others who take for granted no knowledge or experience upon the part of their readers; they expect them to be entertained and instructed by illustrated texts of subjects which have been common knowledge for many years.

JOHN E. SUMMERS, M.D.

TRAUMATIC SURGERY, by John J. Moorhead, B.S., M.D., F.A.C.S.; Late Lt.-Colonel, Medical Corps, American Expeditionary Forces; Professor of Surgery and Director, Department of Traumatic Surgery, New York Post-Graduate Medical School and Hospital; Visiting Surgeon to Harlem Hospital; Attending Surgeon Park Hospital; Consulting Surgeon, All Soul's Hospital (Morristown, N. J.); Lt.-Colonel, Medical Reserve Corps, U. S. Army. Second Edition. W. B. Saunders Company, Philadelphia and London, 1921. Price, \$9.00.

In comparing this edition of Doctor Moorhead's most valuable book with the first, which was reviewed at length in *THE MILITARY SURGEON*, September, 1917, the writer notes that the only criticism of importance made at that time was that the facts developed by the experiences of the war were almost ignored. It was stated that "Very many new ideas in surgery have developed during the war, and fortunately English, French, and some American surgeons and bacteriologists, have found time to put their studies and work in writing, so that civil practitioners and those likely to be called to the colors can have the advantage of their experiences," and that the book from the standpoint of the military surgeon contained nothing new that was not to be found in other books published before the war began. It is a pleasure to state that this criticism no longer holds good. In comparing the chapters of the two editions changes of value will be found in eight; particularly is this noticeable in Chapter I, Wounds and their Complications, which has been re-written; twenty-five pages have been added and the knowledge which war and civil practice have proven reliable is so clearly explained that its application in practice can be safely carried out. The criticism made of Chapter III, Shock, holds in this edition; no change is made. The importance of the subject demands greater attention in a book on Traumatic Surgery. If three rather superfluous illustrations were omitted, about four pages of text comprise all that is said upon Shock. Crile's teachings are ignored. Transfusion, the citrate method, is scarcely more than mentioned as in the first edition, whereas it and some one of the direct methods should be carefully

explained, and the selection of and insistence upon a proper donor taught. Chapter IV, Injuries of the Tendons and Joints, has several pages added, one page being devoted to active mobilization without drainage (Willems' Treatment), the remaining pages containing new cuts. Chapter V, Dislocations, has two pages added. In Chapter VI, Fractures, there is an addition of six pages, with cuts showing preferable sites for amputations in compound fractures. Chapter VII, Special Fractures, has an addition of thirty-four pages, and also cuts of apparatus, as Jones' arm splint; Thomas' splint, of various descriptions; fracture frames, with methods of extension, abduction, and external rotation. In Chapter VIII, Diseases of the Bones, one page on traumatic forms is added. There are a few extra pages in Chapter XI, but no new topics. Chapter XXIV, Standardized First-aid Methods in Accidents, is a new chapter consisting of several cuts of a first-aid jar and contents, treatment of various accidents, standardized first-aid room, method of physical examination, and a modification in making Dakin's solution.

Few surgeons conduct themselves creditably when brought into contact with medico-legal matters, and the writer wishes to repeat what he wrote in the former review of Chapters XXII, The Traumatic Neuroses, and Chapter XXIII, Medico-Legal Phases. These chapters bring out, in a clear and brief manner, valuable advice concerning the surgeon's position in the relation of injury to disease and criminal cases, and also recommends a good working plan of how to make a physical examination of a claimant. Some advice is given as to how a doctor should conduct himself when called into court. Unquestionably Dr. Moorhead has had considerable court experience, and if a physician or surgeon will carefully follow his advice it will save him many irritations and will, besides, place him in good standing with the court, jury, and audience. Again, it is important to state that the last six or seven chapters treat of subjects not found in text-books on surgery, but which are of especial interest to every surgeon doing corporation practice, or, in fact, to every surgeon doing traumatic surgery in civil practice.

There is no more useful book published which is alike of value to the general practitioner in his daily duties and to the men engaged in so-called industrial surgery; in fact, it is a valuable book for any surgeon to own.

JOHN E. SUMMERS, M.D.

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SOME LESSONS OF THE WORLD WAR IN MEDICINE AND SURGERY FROM THE GERMAN VIEWPOINT¹

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[Read before the Association of Military Surgeons of the United States, Annual Meeting, Boston, Mass., June, 1921.]

THE shadows of war are lightened to some extent by the advance in medicine and surgery, which constitutes a by-product of modern warfare. Owing to the enormous scale on which the World War was waged, the changes incident to the upheaval of embattled Europe are proportionately great and far-reaching. The bitter lessons taught by the hardships of war have helped to mature the fruit of conquest over wound infections, war diseases and epidemics. Enormous tasks were set the medical profession by the exigencies of an unprecedented world war. These tasks were in part entirely new and had to be done under almost unbelievable difficulties and obstacles, on the battlefield heaped with wounded men, often in the more or less inadequate and imperfectly equipped field hospitals, in the laborious repair of mutilation and disablement. Medicine and surgery have been enriched through a wealth of otherwise unobtainable practical experience, for the new conditions provided unexpected observations and untrodden paths of research were opened up. All great wars have made great changes, and the world is never the same again after the fighting has come to an end. A change for the better is reflected in medical and surgical knowledge under the stimulus of war necessity.

The lessons of the World War on the side of the Allies are discussed in my "Report on Medical and Surgical Developments of the War" (Special Number, Naval Medical Bulletin, January, 1919), and the present purpose is to review the work done by the Germans during the four years of world wide clinic. The experience of observers of all nations engaged in the stupendous conflict must be collected and compared, and the evidence weighed, before final conclusions can be formulated. German war experience was practically a sealed book

¹The title clearly indicates the aim of the author. It is the German estimate, not ours.

during the time of strife, but since the armistice it is gradually becoming accessible for comparison with the experience of the Allied Medical and Surgical Services. It remains for the future to pass judgment on the merits of the medical profession on both sides, where all concerned undoubtedly endeavored to do their best in the healing of their smitten.

In the autumn of 1915, at a time when the German medical and surgical machine was working as smoothly and efficiently as was their military machine, I was enabled, as a neutral, to observe the medico-surgical activities of the Central Powers, and some of these conditions will be portrayed in the following pages. Later on, after the entry of the United States into the war, information was obtained from neutral sources, including Swiss and Dutch periodicals, from wounded men, war prisoners, and refugees. Since the armistice German medical literature itself has provided data as to the German estimate of their own advances in medicine and surgery through the World War.

Years will have to pass before the tide of international resentment will have ebbed sufficiently to permit the securing of unbiased judgment even among scientific men. The fact must also be taken into consideration that many observers have seen only one portion of the front, or only a single phase of medicine or surgery, while in the interest of the whole, minor individual experiences must all be welded together before final conclusions are justified. It is of the utmost importance, in behalf of suffering humanity, that the forward steps in the evolution of medicine and surgery be definitely established, for measures which have been found of value during the conduct of the war will prove equally beneficial as the same principles are involved, also, in large measure, during the reign of peace.

If the literary output of German authors conveys the impression that the progress of German medicine and surgery is not as striking as the headway made on the Allied side, due weight must be accorded to the comparative psychologic factors and racial characteristics, which here enter essentially into consideration. The Teuton is by nature a patient plodder and toiler, capable of infinite effort and attention to the smallest detail in the endeavor to achieve perfection along given lines of inquiry. In looking for ways and means to scale an apparently insuperable wall, he will begin with an investigation of the soil on which it has been erected, its geological strata, its minerals—not forgetting its bacterial flora!—whereas the intrepid Latin will scale the wall and the dauntless Anglo-Saxon will clear it at a bound. The Teuton worker travels slowly, but he does not rest until he has reached his goal, and none know better than he how to profit by the discoveries or experience of others. From the point attained by the Allied Medical and Surgical

Services, the Germans may go on and yet abundantly do their share towards the perfection of the healing art. After the passing of a decade of international rest and untrammelled exchange of scientific thought, and not until then, will it be possible to collect the pearls brought up by the members of the medical profession of all nationalities from the great sea of human suffering in the war that shook the world. The outcome of the war in the defeat of the German military machine has naturally undermined German ambition and endeavor, and it is a question if the medicine and surgery of the future will be indebted to Germany for many of the fruits of triumph over wounds and disease which always spring from the bloody seeds sown on battlefields. Contributors to German medical and surgical literature claim that they can look back with justified pride on their achievements in the World War and that the part played by them in the progress of scientific as well as practical medicine and surgery must not be underestimated. Undoubtedly, without German X-rays and without Behring's antitetanus toxin, the Allies would have suffered still greater losses than they actually incurred. Aside from what they call the American Dakin-solution, which early in the war was systematically tried and then discarded in their hospitals, German writers state that they have not heard of any discoveries incident to war experience on the side of the Allies. Several authors, writing independently, assert that nearly 90 per cent of their disabled and wounded were refitted for military service in the field and base hospitals, or rendered self-supporting after the conclusion of hostilities. It is officially stated that of two and one-half millions wounded, 83.3 per cent were again rendered fit for active duty in the Sanitary Formations of the Field and Occupation Armies. Of the sick and wounded who reached the home hospitals in Germany, only 1.5 per cent died. Particular attention was given in their orthopedic hospitals to restoring usefulness by providing proper support for indolent useless portions of the body; to the moulding of stumps and the after-treatment of stumps in amputation; to the fabrication of prosthetic appliances for amputated limbs; to the mobilization of stiffened joints; to the improvement of locomotor and supporting apparatus in general. Reparative and reconstructive surgery has always been an important domain of German surgery and has taken a long stride in advance under the exigencies of war mutilations. Many excellent technical inventions were made, permitting a gainful occupation and tolerable existence of many unfortunate war cripples.

The cost of the war to Germany in human material is shown more eloquently than words can express it, by the following statistical figures from authentic sources:

Total losses of the German army from beginning to end of war according to official lists published up to the last of May, 1919

(Schwiening, Sanitäts-statistische Betrachtungen, 1920)

(a) Killed in battle	1,531,048
(b) Missing	991,340
(c) Wounded	4,211,469
(d) Died of disease	155,013
Altogether	6,888,870
Including total deaths	1,686,061

Deaths from disease amounted to only one-tenth of deaths from wounds.

(a) *Killed* means those who died in battle or later on, from wounds inflicted by the enemy.

(b) *Missing* refers to war prisoners and soldiers whose fate remained unknown.

(c) *Wounded* means soldiers whose life could be saved.

(d) Deaths from disease, accidents (aside from deaths in battle) and suicide in the field or reserve armies.

The total number of dead, including the missing and those likely to die from their wounds, was officially estimated as 1,800,000, nearly two millions, for the four war years. The loss of the German population is estimated at 26.5 pro mille of the original number of inhabitants (approximately 68 millions at the beginning of the war). The annual average of deaths of males, in the age group from 18 to 45 years, was 5.5 times greater during the four war years than in times of peace. This group naturally represents the strongest and most productive portion of the German people; more than one-tenth of this number was cut off during the war. In other words, there were 340,000 more deaths per year than correspond to the regular annual average of deaths during military age.

The monthly average of the missing increased during the last year of the war, as a natural consequence of the military events on the Western amphitheatre of war during the summer and autumn of 1918.

The appalling number of war injuries is illustrated by the fact that during the Galician campaign in 1915, no less than 165,000 wounded were transported by rail in barely four months (including about 30,000 war prisoners), a daily average of 1,400 wounded. During the German offensive in the West, in 1918, 80,000 wounded of the Seventeenth Army required transportation, the daily average being 8,000 men. On one day the transportation service was burdened with 12,000 wounded.

As a member of the seafaring branch of the service, I was especially interested in transportation by water routes, which were utilized for relatively short distances when the Germans crossed the Danube in 1915. Steamers with tugboats equipped as hospital ships went from Kerverwara and Barias to the collecting stations on the right shore, Semendria, Dubrarica, and Gradiste, a distance of from 25 to 40 miles, to fetch the wounded. The connection between Semendria and Barias was maintained until the railroad bridge near Belgrade was completed so that the hospital trains could cross the Danube. Transportation by the water route, although a boon to the wounded, has the disadvantage of slowness, and was therefore not found desirable for long distances. At the Western front canal boats were used only occasionally for short distances and for small relays of wounded.

Readers interested in the sanitary condition of the German Navy during the World War are referred to the end of this article for the corresponding statistical data.

Austrian medico-surgical activities are reflected in the reports of the large War Hospital of the Geldinstitute in Budapest, which was opened in November, 1914. Both in regard to size and equipment, this hospital provided the best of care for the sick and wounded. It is interesting to note that the first and second winter of the war brought many cases of disease of the respiratory apparatus and of the joints. The first winter months were especially characterized by the large number of frostbitten extremities, sustained in the Carpathian engagements, whereas during the second winter, when adequate provision against cold and exposure had been made, the respiratory and articular affections predominated. In the Budapest hospital war wounds were represented by 43.5 per cent and internal diseases by 56.5 per cent of the cases. The majority of the wounded came from the Russian amphitheatre of war, owing to its relative vicinity to the hospital. The greatest contingent of all wounds was formed by peripheral injuries (73 per cent); injuries of the trunk were represented by 15 per cent, and injuries of the head by 8 per cent of the cases. About 16 to 17 per cent of the gunshot injuries were complicated by fractures.

It appears that many pitiful cases of frozen extremities occurred during the first winter, 1914-15, nearly one thousand cases of frostbitten toes and fingers, hands or feet, coming under treatment during this period in the Budapest War Hospital.

In the spring of 1915 a military hospital in a suburb of Prague received for treatment 282 cases of frostbite of the first and second degree (including 260 cases of frozen feet, 4 cases of frozen hands, and 18 frostbites of other parts of the body; also 101 cases of frostbite of the

third degree (93 of the feet, 2 of the hands, and 6 others). The winter of 1915-16 brought 95 frostbites of the first and second degree (including 77 cases of frostbite of the feet, 3 of the hands, and 15 others) and 33 frostbites of the third degree (including 31 frostbites of the feet, 1 of the hands, and 1 case of frostbitten ears). Cases of the first degree were most efficiently treated with lukewarm baths and by painting the parts with iodine tincture. In frostbites of the second degree, the application of iodine tincture was supplemented by emptying the vesicles and dressing the superficial skin ulcers with boric acid ointment. Frostbites of the third degree were treated without operation when possible, and as a rule only a few toes were lost, but in one instance the foot had to be removed as far as the talus and in another low amputation of both legs was unavoidable.

PROGRESS OF GERMAN SURGERY

Noteworthy facts in the progress of German surgery incident to the World War are discussed in the following under five headings, which show at a glance what the war taught Germany about wound treatment:

- I. Improved control of wound tetanus.
- II. Introduction of deep antisepsis.
- III. Institution of a uniform successful treatment of gunshot fractures.
- IV. Adoption of active surgical measures in gunshot wounds of (a) the skull and (b) the abdomen.
- V. Improved vascular surgery.

I. IMPROVED CONTROL OF WOUND TETANUS

An appalling number of wounded with tetanus infection arrived in the German war hospitals at the Western front as soon as the contaminated soil of the Champagne had been ploughed up by the thickly falling artillery projectiles. The statistical figures of Madelung show a mortality of about 70 per cent among 174 cases of tetanus which came under his observation during the first three months of the war. On the basis of a larger material, of 351 cases, Kimmel reported at the first surgical meeting held in Brussels in April, 1915, that 242 died and 109 recovered, making a mortality at the front of 70 per cent. The tetanus incidence steadily increased during the first winter, and according to Behring actually reached 4 to 5 per cent in certain sectors of the front. On the Eastern amphitheatre of war, especially on the sand plains of Poland, the number of tetanus infections, while still large, was not nearly so high as in Flanders.

Prophylactic injections of Behring's tetanus antitoxin were soon administered as a routine procedure in all wounds, by order of the

Feldsanitätschef, Otto von Schjerning, with the result that wound tetanus was brought well under control. The large available supplies of the serum in German laboratories and factories were promptly commandeered by the Army administration for these prophylactic inoculations, to such an extent that there was not enough serum left on the market for the treatment of patients who arrived with tetanus in certain war hospitals, notably at the Eastern front. In active cases the intraspinal administration of magnesium sulphate was followed by beneficial results. In base hospitals situated at a distance from the front, the effects of curative serum inoculation were found to be greatly superior to results obtained in peace practice. This is probably explained by the timely employment of the serum in large doses and in a more appropriate way (intravenous or intraspinal administration).

One of the lessons learned by Germany in the war concerns an advance in the early recognition of the incipient symptoms of tetanus. The first step in advance was the discovery of local tetanus as the earliest sign of the disease. Observers learned to interpret the primary manifestations of general poisoning in this infection as an increased irritability of the central nervous system, with the resulting disturbances of the delicate and complicated reflex movements.

Gas gangrene.—This dreaded wound infection was combated by the Germans by free incision and drainage, antiseptic agents, Bier's hyperaemia, and towards the end of the war by means of a polyvalent antibacterial and antitoxic immunity serum, directed primarily against bacterial growth, but also against the effect of bacterial toxins. This serum was administered as a prophylactic measure and also as a curative agent, in the form of early repeated injections. It is claimed that experience during the last part of the war showed that the employment of this serum, especially as a prophylactic agent, was attended by highly beneficial effects. The chapter on "Gas-Bacillus Infection" in the "Report on the Medico-Military Aspects of the European War," 1915, by Surgeon A. M. Fauntleroy, U. S. Navy, will be found of value and interest in this connection.

II. DEEP ANTISEPSIS

This salient achievement of German war experience, introduced by R. Klapp, is based on early wound excision in combination with the strongly disinfecting action of the higher homologues of the hydroquinine series, which in contradistinction to other antiseptic agents cause no serious tissue damage. As a very powerful disinfectant, readily tolerated by the tissues, the Germans used a preparation (isoctyl hydrocuprein) named Vuzin, after Vouziers, a small town in northern France. The method of deep antiseptics is carried out by uniformly

injecting all tissues, after the wound has been excised, with a solution of Vuzin, 1:5000. For days afterwards the solution leaves the wound through a retrograde lymph flow, and the emigration of leucocytes is diminished, but the curative effect of deep antisepsis is essentially credited to the strong disinfecting power of the remedy.

Wound infections increased enormously in the first months of the war, as a result of the conditions of trench warfare. For the better control of these infections, conservative measures were soon abandoned, under the leadership of Garré, Ritter and Kroh, in favor of wound purification, with very good results. The wounds were radically handled and extensively excised as soon after their infliction as possible. Early excision promptly became the routine procedure at the entire front. The results in many cases were still further improved by primary wound suture, which often shortened the healing process by weeks or months. Besides excision and drainage, antiseptic agents were employed, especially in the form of wound irrigation with carbolic acid solution (3-5 per cent). The Germans heard of the benefits of hypochlorite solutions and adopted the Carrel-Dakin treatment to some extent, but found this too complicated and not necessary after radical wound excision had been adopted as a routine procedure.

German war surgeons soon realized that *infection* was the predominant feature in the injuries of the World War, and that the percentage of severe infections with life endangering complications was very high. The early hopes of some German war surgeons to the effect that their splendidly organized sanitary service would provide such favorable conditions of transportation and treatment as to reduce infection to a minimum, were blighted by the experiences of the first great battles, which within a few days brought an enormous number of wounded, so as to overwhelm even the most efficient sanitary services. During my visit in Germany as a neutral, in 1915, I learned that many wounded were not found until they had been exposed for days on the battlefield without attention of any kind. Others who could be transported relatively soon to the main dressing stations or farther back to the field hospitals arrived in such numbers that much time elapsed until the wounds could be properly treated. One of the chief causes of the high percentage of infected cases must therefore be sought in the relative failure of first aid and transportation facilities, owing to the unprecedented numbers of the wounded. The conditions of trench warfare played an important part in this respect, and climatic factors were also cooperative, the wounds being much more liable to infection in warm than in cold weather. It is hardly necessary to mention that the

large numbers of artillery projectiles used in this war was essentially responsible for the high percentage of wound infection.

The increase of artillery wounds in the World War caused German war surgeons to abandon the old rule of von Bergmann, to regard all gunshot wounds as sterile. Conservative wound treatment was soon replaced by active operative measures, and mild antiseptic agents came into favor instead of pure asepsis. For example, Garré employed as irrigating fluids with a large mechanical action, very dilute watery solutions of iodine; hydrogen peroxide (3 per cent); mercuric bichloride (1:5000); or Dakin's hypochlorite solution. Rest and fixation of the wounded part were extensively used as the most important adjuvant of wound repair.

For the *prevention and control of infection*, German war surgeons found nothing to equal a careful purification of the wound and its environment, with complete fixation of the limb in plaster dressings. As a prophylactic measure, the wounds were incised, drained, and the wound surfaces excised, unless there was reason to fear that excision would materially impair the function of the part.

Primary suture, after excision of war wounds, is a noteworthy advance in German war surgery. The wounds were at first treated with dry dressings, later by open treatment, then by half-open, so-called physical wound treatment with hypochlorite solution. Badly lacerated and contaminated wounds were excised in healthy tissue, "like malignant tumors," with very good results. In a field hospital under Fründ's direction, 184 or 280 wounds were closed by primary suture, after excision and irrigation with hypochlorite solution. Upon the basis of experience with 207 cases, Hufschmid and Eckert were enabled to state that even very extensive shrapnel wounds of soft parts could be made to heal primarily through excision and suture, even when the injury dated back over twenty-four hours. Suppuration and general sepsis were reduced almost to a minimum after extensive wound-incision and primary suture. The method was found to result in favorable repair, with smooth linear cicatrices and a greatly shortened period of convalescence. A much smaller number of infected cases left the field hospitals where immediate purification of the wound was the rule than came from those stations where conservative measures were in favor. Gas gangrene and other grave infections were especially rare after primarily radical treatment of gunshot wounds of soft parts. The length of time after which wound excision and primary suture still had a curative effect in Hufschmid and Eckert's experience in a field hospital is very noteworthy. Early in the war it was assumed in Germany, as well as in the Allied Medical Services, that this mode of

treatment presupposes the arrival of the wounded in the hospital within the first six hours or so after the infliction of the injury. It was also assumed that large artillery wounds with extensive destruction of muscle and bone were not amenable to excision and primary suture. Encouraged by their good results in cases of badly contaminated injuries of the soft parts of the head, dating back over twelve hours, the above-named operators gradually came to perform excision and primary suture in many cases of large artillery wounds of all parts of the body, with extensive destruction of tissues. The fact is especially emphasized in their report that the good results of this method were obtained also when the injury dated back twenty-four, forty-eight or more hours. Readers familiar with the principles of primary wound treatment on the Allied side will be interested in comparing this statement with comments on the relative period of contamination as distinguished from dissemination and infection, given in my "Report on Medical and Surgical Developments of the War," Special Number, U. S. Naval Medical Bulletin, Washington, January, 1919.

III. GUNSHOT FRACTURES

The institution of a uniform treatment of gunshot fractures was soon found to be an urgent necessity on the German as well as on the Allied side. The remarkable frequency of gunshot injuries of the extremities is emphasized in all recent war statistics. By a German authority (Goldammer) their number is estimated as five-sixths of all war injuries. The number of gunshot fractures is proportionately high, their astounding frequency being explained by the destructive action of modern projectiles, and especially by the enormous increase of artillery wounds, as compared to former wars. Figures are now available concerning the first half of the war, and we find, for example, that in the Budapest War Hospital, service of W. Milko, altogether 4,530 war wounds came under treatment during the period from October 15, 1915, to May 1, 1916, including, 3,336 gunshot wounds of the extremities. The latter again included 884 gunshot fractures, or 26.5 per cent of all peripheral injuries. The great majority of these fractures concerned the upper extremity (728 of 884 cases); only 66 patients had fractures of the thigh, and 90 had fractures of the leg. On examination of this material in regard to the various types of fracture, the majority were found to be splintered fractures in two-thirds of the cases. Simple transverse and oblique fractures were seen in 20 per cent of the total material. Fractures with extensive shattering of bone or large bony defects were relatively common, whereas perforating gunshot wounds of bones were rather exceptional. As regards the frequency of infection, 331 of the 884 gunshot fractures in the Budapest Hospital healed practically by

first intention; in 187, considerable suppuration occurred, and symptoms of grave general infection were present in 66 cases. It must be added that the small caliber injuries greatly predominated in this material, whereas shell and shrapnel wounds were very rare, the reason being that this hospital received 80 per cent of all gunshot fractures from the Northern amphitheatre of war, where the artillery engagement was not nearly as active as at the Western front.

The Germans soon learned that radical procedures were urgently indicated in all cases which reached the dressing station or the field hospital with symptoms of grave infection, especially in all cases of gas phlegmon. According to their experience, life could usually be saved only through immediate amputation in subfascial infections, whereas in epifascial infections the process could often be arrested by the timely performance of multiple incision. *Prophylactic tetanus-antitoxin* injections were given with excellent results in the dressing stations to all soldiers who arrived with badly infected fractures. The second measure of the Germans against wound infection consisted in *immobilization* of the gunshot fracture. The object was to aid in the limitation of the spreading of infection. The mode of fixation of the fracture naturally varied according to the site and degree of the bony lesion. The greatest difficulty was naturally encountered in the proper treatment of fractures of the thigh, the consensus of opinion being to the effect that circular fenestrated plaster apparatus constitutes the best transportation bandage for femoral fractures. The Germans constructed many ingenious extension splints, but it was found that even the very best of these could not compete in their judgment with good plaster apparatus in the securing of absolute immobilization of fractured limbs.

Extension combined with semiflexion was found to be the most appropriate mode of treatment for fractures of the thigh. No matter what treatment was used, however, these cases with few exceptions all healed with shortening, which increased in proportion to the bony defect caused by the wound and to the time interval between the injury and the extension. Other causes of shortening were early, over-radical operative interventions, with extensive removal of the fracture ends. More or less limitation of motion in the kneejoint was found to be inevitable in fractures of the thigh treated in plaster apparatus. Consolidation of the fracture occurred as a rule under all methods of treatment.

The treatment of joint wounds by German war surgeons underwent a decided change in the course of the war. Early in the war it was hoped that the majority of articular lesions would heal through simple fixation in plaster apparatus, but the preponderance of destructive

artillery wounds later on enforced the adoption of more radical measures, especially for the large joints, with on the whole very satisfactory results. Attention was called by Hofmann, of the surgical group of Hochenegg's clinic, to the fact that complications on the part of a joint may occur also in the absence of direct articular involvement, namely, when in *gunshot wounds of bones* near the epiphysis, bone-fissures extend as far as the joint. Suppuration in these cases may extend to the joint by way of the bone fissures. Incision of the joint and even resection were often found to be inadequate in these cases, and radical procedures are advocated by prominent German war surgeons, who cautioned against delay if good results do not promptly follow upon treatment of the fracture and incision or resection of the joint. In these cases amputation above the fracture is indicated as soon as possible, in order to save at least the life of the patient.

Wounds of the kneejoint were systematically treated in many German field hospitals with Vuzin, a quinine derivative, and according to the observations of Stieda, fewer failures were noted in the sanitary stations near the front under Vuzin treatment of joint injuries than under routine employment of carbolic acid or camphorated phenol, which requires more accurate and permanent supervision.

The introduction of Vuzin into surgical practice is hailed as a great progress in wound treatment by German writers. Excellent results are claimed to have been obtained especially in the treatment of suppurating joints, which usually healed under Vuzin therapy without complication and were not followed by permanent motor disturbances. The prophylactic employment of Vuzin was found to act as a valuable protection against wound infection, and deep antisepsis with this substance permitted primary suture of any infected territory in the experience of some of its advocates. Shell splinters and other debris were removed from bones and joints under combined local anesthesia and deep antisepsis, and the tissues were then sutured in layers, without packing or drainage of any kind.

It is recommended to administer Vuzin at a strength of 2 per cent, dissolved in physiological salt solution which must be entirely free from soda, to leave the drug its full efficiency. Novocain in a concentration of a half of 1 per cent is added to the Vuzin solution, in order to combine a prompt analgesic effect with the antiseptic action of Vuzin, which is very painful when incorporated into the tissues by itself. The technique of its administration follows the customary rules of local injection-anesthesia. The remedy must be made to penetrate wherever there is the slightest evidence of infection. A single application is

usually not sufficient, and the treatment must be repeated once or twice, depending upon the degree of bacterial contamination of the wound.

Transplantation of fat tissue in joint operations, for the restoration or preservation of movements (first used by Murphy in 1902), was adopted by Lexer about ten years ago and utilized in war surgery with very gratifying results. In those particular areas where it is exposed to pressure and strain in movements of the joint, the transplanted fat tissue becomes apparently transformed into a strong connective-tissue splint which helps to preserve a movable articulation. The fat is usually taken from the anterior, outer, or posterior surface of the thigh, sometimes from the lower abdominal region. The procedure is reserved for the treatment of ankylosis after gunshot wounds of the kneejoint, in those cases where no large portions of the articular ends have been splintered and removed after suppuration. At the end of joint suppurations, fat transplantation should not be performed until at least six months have passed without reappearance of fistulas. Up to 1916 this method according to Lexer's report was carried out in only a very small number of injuries of the kneejoint. An illustrative observation concerns a soldier operated upon twenty-six days after an infantry projectile had passed from above through the upper recess into the bone and lodged in the joint between the two condyles. On its removal, the articular cartilage was found to be detached from the condyles on both sides of the projectile. After the bullet had been extracted, the loose articular covering was removed and the joint surface of the femur was completely encased with fat tissue. The patient was discharged with a movable kneejoint three months later. Upon the basis of its merits, the method evidently became more widely adopted as the war progressed, and Dr. Schlaepfer, assistant professor of surgery in the University of Zurich, who for two years worked as a neutral in a military hospital in Leipsic, saw two dozen cases of kneejoint injury successfully treated by means of fat transplantation.

Conservative treatment of severe gunshot injuries of joints, by means of the hyperaemia method, was advocated by Sehrt, who claimed that this procedure reduces the danger of general infection and local extension to a minimum, including cases of joint suppuration after gunshot wounds. General infection was prevented in the majority of the cases, and local repair could be conducted in such a way, without major interventions, as to secure a satisfactory function of the joint. Relief of pain in most cases is an important feature of this treatment. Although recent injuries, of two to three days' standing, are the chief domain of this therapeutic measure, it is also claimed to be highly efficient in the presence of chronic circumscribed suppurative processes.

The constriction bandage is left in place during an average time of six to seven days, or up to fourteen days in very severe cases. The wound itself is covered with sterile gauze and left to itself, the affected extremity being put at rest in splints.

The technique of permanent constriction consisted in the application of a black rubber bandage at the thigh or upper arm, so as to leave a zone of undamaged tissue between the wound and the bandage, which was usually practicable even in lesions situated near the root of the limb. It is claimed that a very satisfactory hyperaemia can be obtained by applying the rubber band with very gentle traction, slightly more than is used in the application of a plaster bandage. The patient should barely feel the pressure of the bandage. A visible repletion of the peripheral skin veins makes its appearance very soon after the application of the bandage, and is followed a few hours later by the first signs of incipient edema, usually accompanied by a bright red color of the skin. Importance is attached to the following points: pulsation of the peripheral arteries must always remain palpable; the peripheral part must not become anesthetic; the skin must not turn blue and cold, but red and warm; the pressure of the bandage should never be felt as pain.

For infected intra-articular gunshot-fractures, typical resection is indicated as soon as the temperature reveals the onset of a grave infection, in order to guard against the loss of the extremity or life itself, in the opinion of Philipowicz. The problem of recurrent and latent infection, especially in war wounds of the large joints and bones, is a very serious one and involves the necessity of careful *after-treatment* of all severe or badly infected injuries, more particularly those caused by artillery projectiles. Most, in his suggestions to war-surgeons, pointed out the necessity of prolonged and exact immobilization of all seriously damaged and infected extremities.

Contractures were treated with very good results by means of Schede's permanent apparatus, which was left to act upon the patient as long as possible, preferably in combination with Bier's hyperaemia of the extremities. The injured leg is placed on an iron frame covered with webbing, which is perforated at the site of the wound; the leg is thus reliably protected, put at rest, and can be dressed as desired.

IV. (a) GUNSHOT WOUNDS OF THE SKULL AND BRAIN

The adoption of active surgical measures in these cases by the Germans saved many lives. All gunshot wounds of the skull are regarded as infected by Müller, who operated upon 180 cases, including 46 wounds of soft parts, 60 bone wounds, and 74 brain injuries. In conformity with the rule to expose without delay all recent untreated gunshot wounds of the head, without exception, early operation was

performed in 132 cases. The tense, nonpulsating dura was always incised, the cavity was drained with a rubber tube, around which gauze was packed; in the course of two to eight weeks the drainage tube was progressively shortened and finally removed. Small superficial cavities were packed with gauze. In order to guard against prolapse-formation and incarceration, the brain was exposed as widely as possible. Gunshot wounds near the base of the skull gave rise to special difficulties. Of the 180 patients, 31 died; complications on the part of the brain being the cause of death in 25 cases. In purely soft parts injuries and lesions of the external table alone the mortality was zero; in injuries of the internal table it was 2.6 per cent; in injuries of the brain, 39.2 per cent. The mortality of primarily operated gunshot wounds of the brain was 34 per cent; of secondary operations, 67 per cent. The prognosis was most serious for impacted projectiles (mortality of 70 per cent); perforating gunshot wounds, 36 per cent; glancing gunshot wounds, 34 per cent. It is interesting to note that of 103 cases of skull and brain injury, 48 men became again fit for military service.

Altogether 139 cases of gunshot wounds of the head, with 10 deaths, were reported by Uffenorde. In superficial brain wounds loose iodoform gauze packings were used; in deep abscesses, large glass drainage tubes were employed; in the presence of brain prolapse, the infection was combated by antiseptic agents, such as iodine tincture, iodoform powder, or hydrogen peroxide. In all cases of brain infection, urotropin was administered by the mouth. Osteoplastic repair was postponed until the end of three months, after the wound had healed. Pedunculated bone and periosteal flaps were given the preference over free transplanted bone flaps.

In discussing the treatment of gunshot wounds of the skull in dressing-stations at the front, Hahn mentions favorable experiences in 632 cases, with a mortality of 11 per cent. The principal cause of a bad outcome consists primarily in wound infection, which is best controlled through the creation of aseptic surroundings. This should be followed by exploratory incision and further surgical intervention if indicated.

Primary complete closure of skull wounds, in fact of all gunshot injuries, was advocated by Barany, on the basis of twelve extremely serious cases which were cured by means of this method. In six cases of severe skull-splinter injuries, in highly infectious territory, Hisehe primarily covered the dural defect with fascia, after excision of all infected tissue, and obtained an uninterrupted recovery in four cases. The procedure is recommended as reestablishing physiological conditions in the cranial cavity. This view is not accepted by all German war surgeons, however, and Fraenkel, for example, cautioned against

the general adoption of primary wound closure in the very changeable environment of war-surgical activities. Pribram obtained only 6 primary cures among 29 cases treated by primary wound suture; in the remaining cases, the sutures soon required removal. The operations were not performed until two days after the injury, but under favorable aseptic conditions. In a later contribution this observer emphasized the necessity of early operation, in order to avoid brain abscess. Upon the basis of 104 gunshot wounds of the skull, including 97 with brain lesions, Erdelyi reached the conclusion that these cases should be operated upon as soon as possible, with removal of all kinds of foreign bodies and establishment of free drainage. Closed wound treatment did not work well in his experience, the sutures usually having to be removed soon after the operation, on account of rising temperature. Of 24 patients who were operated upon in the first three days, only 3 died; of 9 patients operated upon after the twenty-first day, 3 died. In the presence of impacted projectiles, exposure of the entrance orifice and removal of the splinters is indicated, also when the projectile itself cannot at once be removed (18 cases, with 6 deaths). The treatment of encephalitis consisted in wide exposure, free drainage, removal of foreign bodies and routine application of spinal puncture. Whenever there is any suspicion of meningitis, repeated spinal punctures, one or two daily, with evacuation of much cerebrospinal fluid (up to 50 c.c.) enter into consideration.

In a field hospital at the Eastern front, Boit was enabled to observe 171 cases of gunshot wound of the skull, admitted in the course of fourteen months. Of these, 79 succumbed to their injuries, although primary wound treatment was regularly carried out. Impacted shrapnel cases have twice the mortality of impacted gunshot projectiles. The prognosis in all cases improves with the timeliness of wound inspection and treatment. Another contribution from a field hospital by Blumenthal concerns 28 cases of gunshot wound of the brain, with 15 autopsy records. He points out that the hole in the bone is almost invariably smaller than the hole in the meninges, and that the hole in the dura must be exposed in a wide circumference, in order to provide an unobstructed drainage of the secretions.

The following statistical figures, given by Münch, are of interest: of 153 cases of gunshot wound of the skull, 13 were brought to the field hospital dead and 38 in a moribund condition; 102 patients were operated on; 12 of these died.

IV (b). GUNSHOT WOUNDS OF THE ABDOMEN

Upon the basis of experience in the Balkan wars, a number of German operators had already become firm adherents of active procedures

in these cases, whenever warranted by external conditions. Many lives were undoubtedly saved by the adoption of operative measures instead of the surgical reluctance which prevailed in former wars. Importance is attached by German writers to the time interval between the infliction of the injury and the performance of the operation. They learned that the results of treatment could be primarily improved by providing the means for easy and rapid transportation of the wounded, thereby shortening the time between injury and operation. In one series of cases, for example, four of the patients who could be operated upon within the first six hours recovered, whereas only one recovered of eight patients who came to operation between six and twelve hours after the injury. By means of early operative interference, Kraske saved 20 of 39 wounded, and Laewen saved 27 of 54 wounded. Among 21 cases of abdominal gunshot wounds, with gastro-intestinal lesions, operated upon by Hellwig in a field hospital, there were 7 recoveries and 14 deaths, 4 of these deaths being due to associated injuries of other organs. The majority of abdominal gunshot wounds apparently proved fatal from hemorrhage rather than from peritonitis. By some war surgeons, operative intervention was restricted to those cases which were complicated by intestinal prolapse. The majority decided in favor of early interference, whenever practicable. In a general way, the conclusion was reached that the treatment of gunshot wounds of the abdomen had to be governed not so much by surgical indications as by operative facilities. A soldier who had received fourteen perforating wounds of the gastro-intestinal canal, caused by a lead bullet fired at close range, was operated upon by Küttner a short time afterwards, and his life was saved through purification of the abdominal cavity and with application of intestinal sutures. On the other hand over 52 per cent of the wounded with gunshot injuries of the abdomen who were sent to the Infantry Division Sanitary Institute directed by Hahn, died on the way there or soon after their arrival (130 of 247 cases). Upon the basis of such observations, German war surgeons naturally insisted upon the speediest possible transportation of men with abdominal wounds, from the first-aid stations to the better equipped field hospitals, for the purpose of timely operative treatment. The more successful handling of these cases constitutes one of the surgical lessons that the war taught Germany.

Gunshot wounds of the chest.—According to Kehl's observations in field hospitals, the worst of the injuries caused by artillery projectiles were those produced by shrapnel bullets. The majority of patients reached the hospital in the first twenty-four hours after the injury; there were altogether 55 gunshot wounds of the chest, including 41

cases with pulmonary lesions; 30 wounds were inflicted by artillery projectiles, 24 by infantry projectiles, and 1 by a so-called hand grenade. Of the 30 patients wounded by artillery projectiles, 5 died; of those wounded by infantry projectiles, 1 succumbed indirectly to the injury. The non-penetrating gunshot wounds of the chest were associated with symptoms of dyspnea, hemoptysis, and occasionally with hemothorax, but as a rule ran an afebrile course, without dangerous manifestations on the part of the lungs. When the pleural cavity was opened, the clinical picture was grave on account of the existing infection. Landois performed suture in nine cases of gunshot wounds of the lungs and thoracic wall, in a field hospital. Four patients died and five patients with very severe open injuries of the chest wall and circulatory disturbances were saved by the operation. A simple hyper-pressure apparatus, worked by a pair of bellows, proved very useful. The thoracic wound was enlarged so that the chest cavity could be palpated with the hand; when a lung wound was demonstrable, it was closed by deep and tight silk sutures, and the lung was then sutured into the chest wall so that the pulmonary suture came to lie in the thoracic opening. In one case, wound repair followed without any complication; in other cured cases, an empyema formed. The costal resection, required for the drainage of the empyema, was performed at the earliest, ten to fourteen days after the first operation, with careful preservation of the point of attachment of the lung.

V. IMPROVED VASCULAR SURGERY

The treatment of vascular injuries represents a field of German war surgery which has been essentially modified through the experience of the World War. The German literature of the four war years contains many contributions on the handling of war aneurisms and other lesions of the blood vessels at the front. Prior to the war Lexer had advised that after complete or incomplete extirpation of the aneurismal sac, an attempt be made to preserve the normal circulatory channels by means of vascular suture, when at all practicable, instead of applying vascular ligatures, which involve the serious danger of peripheral gangrene. This rule was destined to exert a revolutionary influence upon the treatment of all war aneurisms and also to modify the primary handling of recent gunshot wounds of blood vessels. During the war, Lexer expressed himself unconditionally in favor of early operation on vascular wounds in general, and encouraged by his success, many German war surgeons began to utilize primary suture as the routine method of treatment for recent gunshot wounds of the large vessels. Rehn, who at the Surgical Congress in Brussels, in 1915, reported 421 arterial injuries, in 201 of which arterial ligatures were applied, adopted

primary vascular suture in the summer of 1915, after several unsuccessful experiences with vascular ligation. His remarkable results, obtained under highly precarious external conditions, led him to urge the performance of suture as far as possible in all vascular gunshot wounds. As the war progressed and experience with these cases increased, the indications for vascular suture were gradually extended. German operators claim a remarkably favorable course of wound repair under the suture method, essentially different from and superior to the conditions prevailing after the application of vascular ligation. Plastic operations on damaged blood vessels were proposed by Küttner in the rare cases of large vascular defects. In his experience with 105 cases of war aneurism (with one death and one gangrene), lateral suture or circular union proved usually sufficient. When plastic procedures are desirable on account of extensive injuries, the wall of the artery can be reconstructed by means of flaps from the wall of the aneurismal sac.

GENERAL REMARKS ON SURGICAL AND MEDICAL SERVICES IN GERMAN
WAR HOSPITALS

There was a tendency among German war surgeons, in the early part of the war, or so it seemed to me in a cursory peep behind the enemy's lines in 1915, to pack the wounds too tightly, resulting in pus-retention instead of the intended aspiration of the pus. It is more than likely that the Germans profited by the experience of French operators, with whose work they soon became familiar through bits of information obtained from wounded men who fell into their hands and other war prisoners, for the principle of extensive exposure of all wound angles, tracts, recesses and cavities (the famous French "*débridement*") with unobstructed drainage; in other words, the creation of physical conditions favorable to wound repair was soon emphasized on the German as well as on the Allied side.

During the war, judging from my personal observation and from information obtained later on from various sources, general anesthesia was usually conducted with ether. For minor interventions, ethyl chloride and morphine-scopolamine were also employed. Local anesthesia, in its varied forms, was found to be a powerful adjuvant of war surgery in the experience of German operators.

During a tour in Germany as a neutral in the fall of 1915 the careful division of labor in German war hospitals impressed me as a valuable adjunct in permitting all the wounded to be attended as promptly as possible. All bandaging and dressing material was sterilized in their fine, practically indestructible field-sterilization apparatus; every single piece of gauze, whether previously sterilized or not, was exposed to the action of steam and always transferred from the sterilizing apparatus

directly to the wound. All cloths, napkins and towels used during the operation were likewise sterilized in water vapor and rendered germ-free in the main dressing station by boiling for ten minutes and keeping them in a strong bichloride solution. In the early part of the war there was certainly no lack of bandages or medicines on the German side, the supplies from their own or looted Belgian and French pharmacies meeting all requirements. But before the end of the war, which had outlasted all expectations, supplies of this kind, like many others, ran short in Germany and a number of saving devices were adopted. Due to the increasing deficiency in suitable raw materials, many obstacles were also encountered in the production of the urgently needed surgical instruments.

The large bandages otherwise regularly lost in the removal of plaster casts were recovered by causing such patients to sit in warm salt water; the plaster could thus be removed without hurting the bearer, while the bandages could be easily rolled, sterilized, and used over again. Paper bandages, woven like fabrics and soaked in plaster of Paris, were used to some extent for plaster dressings and fixation apparatus. Other substitutes for plaster gauze bandages came in the form of rolls of ordinary crepe paper, coated with a very thin solution of stearin and sprinkled with powdered plaster. In the experience of German war surgeons, these bandages after having been dipped in water proved sufficiently firm and flexible to act as a satisfactory substitute.

In view of the prevalent German myopia, the equipment of the fighting machine with spectacles acquires considerable interest. As early as December of 1914 this need became apparent, and in order to enable the soldiers to shoot accurately in all positions of the body, spectacles with round glasses were generally introduced in the field army in April of 1915. An improved model for the wearers of gas masks came out in the winter of 1916 and all other spectacles were gradually discarded. Since November of 1917 all optic glasses were made considerably thicker than in the past, for the better protection of the eye against injuries of all kinds.

On my tour of inspection behind the enemy's lines, in the fall of 1915, I was informed that a large number of preexisting eye diseases were first noticed in the field, or discovered as accidental findings. The number of trachoma cases was said to be inconsiderable. Special ophthalmological service was requested early in the war for all field hospitals, and especially for the so-called quarantine stations. In January of 1915, 61 cases of, for the most part, very grave war injuries of the eye were under treatment in the Tübingen Reserve Hospital.

A visit to the Sanitary Laboratory in Berlin, in the fall of 1915,

impressed me with the evidences of the well-known German efficiency. Everything was done on a large scale, great quantities of typhoid and cholera vaccine being constantly under preparation. This large and splendidly equipped building, under the management of a professor of the University of Berlin, was reserved entirely for special work for the army. At that time routine vaccinations for typhoid fever, cholera and small-pox were carried out on every soldier of the great German fighting machine, in three sittings for typhoid, one or two for cholera and one for smallpox. No efficient vaccine against wound sepsis was then available, nor was such a vaccine evolved in the course of the entire duration of the war.

CONTROL OF WAR EPIDEMICS BY PROTECTIVE INOCULATIONS

On turning to the medical aspect of the war, there is an outstanding fact which at once challenges attention and demands relief: *venereal diseases* ranked first in frequency during the entire duration of the war. Next in order followed *malaria*; next, *dysentery* and *typhoid fever*; last and least, *typhus* and *cholera*. In the individual years of the World War, the incidence of venereal diseases remained practically the same throughout, as distinguished from the infectious diseases. With special reference to malaria, the number of cases increased in the third and fourth year of the war, probably primarily due to the advance of the German troops in the East and their sojourn in Turkey. The behavior of the infectious intestinal diseases is noteworthy, typhoid fever progressively diminishing in the third and fourth year of the war, whereas dysentery, after decreasing in the second year of the war, again increased to a considerable degree later on. Cholera was greatly inferior in frequency to typhoid fever and dysentery. The same is also true for typhus, although there was an increased incidence of this disease among the German civilian population during the first year of the war. Other infectious diseases, such as smallpox and recurrent fever, were relatively too infrequent for inclusion under the heading of German war-statistics on epidemiology. As regards the management of war epidemics, German writers emphasize that due to the advance of hygiene and internal medicine, the toll taken by infectious diseases was incomparably smaller in the World War than in previous wars. With special reference to venereal diseases, the Germans claim that experience gained in the World War will prove of value and benefit after the war for the preservation of the health of the people.

Protective inoculations.—According to the experience of the World War, protective inoculations essentially facilitated and supported the control of epidemics, but they would have failed without the tried and tested hygienic measures of the past, such as a free supply

of pure drinking water, proper removal of waste matter, rapid isolation of patients as well as suspected cases, thorough disinfection, and so forth. The actual value of protective inoculations cannot yet be stated on the basis of statistical figures. Germany carried her protective inoculations as far as the men in the trenches, at the onset of several typhoid fever epidemics in the Western amphitheatre early in the war, as well as against the threatened invasion of cholera in the East. Practical experience conclusively showed that the two intestinal infections for which a protective vaccine on a solid scientific basis is available, namely *typhoid fever* and *cholera*, considerably diminished during the four years of the war. The former not only decreased numerically during these four years, but its course showed a milder character and the mortality was proportionately lessened. In 1915, according to personal information obtained in the Berlin City Sanitary Laboratory, three vaccinations were given every soldier as a routine procedure practically at the same time—for typhoid fever, cholera, and smallpox.

Typhoid fever.—The typhoid fever incidence was kept in check during the entire war by general typhoid vaccination, including the men in the trenches. Not only the enlisted soldiers were vaccinated, but also the recruits who were about to be sent to the front. Protective vaccination was in general use by 1915, with an undeniable effect on the morbidity of typhoid fever. The mortality was likewise diminished by the vaccination.

Cholera.—The German army remained practically free from cholera in the war. Upon the basis of their war experience, protective vaccination against cholera is now regarded as a necessary adjuvant in the fight against this disease. The authoritative text-book of Kolle-Hetsch, on Experimental Bacteriology, contains a statement to the effect that protective vaccination against cholera in the World War proved brilliantly successful in the armies of the Central Powers.

Smallpox was relegated entirely to the background during the World War, in the German army as well as in the numerous prison camps. The rare cases which occurred could always be traced to infection from the outside. All soldiers and other members of the army who had not been vaccinated for four years, or suffered from the disease itself, were revaccinated. All war prisoners were vaccinated without delay. The results of these active prophylactic measures were excellent.

Malaria.—This disease ranked second in frequency next to venereal diseases during the war, especially in the latter part, and the German-Austrian Staatsamt made malaria a reportable disease in March, 1919. Imperfectly cured cases and latent infections acquired progressive

importance from year to year in the diffusion of malaria, and for the prevention of its spread the Germans devised what they call experimental activation of latent malaria cases, in the form of routine provocation of the disease by alternate heating and chilling of the body, with gentle Faradization of the splenic region on two successive days, followed by microscopic examination of the blood for the plasmodia. This ingenious procedure was first carried out practically, and on a large scale, by Hoffmann in Russian-Poland. Several other methods were also suggested for mobilizing the latent plasmodia in the body and forcing them into the bloodstream. However, upon the basis of a number of malaria epidemics during the war, German writers admit that prophylaxis and therapy of the disease are still capable of improvement.

Trench-fever was very prevalent at the Eastern front in 1916-17, and crowded the field hospitals. Its etiology was not ascertained during the war. Disinfection, destruction of lice, as well as isolation of patients, were employed for its control. Quinine and salvarsan usually proved inefficient. This disease figures in the German literature also as Wollhynian fever, five days' fever, and Werner-His disease.

No useful or reliable vaccination against *typhus* was devised by the Germans during the war. The disease was soon recognized as exclusively louse-borne, and preventable by strict isolation of the infected and vermin-infested men. In rigorous application of this principle, nothing outside of absolute quarantine of the infected camp, for the protection of the civilian population, was done by the Germans for the control of the severe typhus epidemic which raged among the unfortunate inmates of the Wittenberg prison-camp in the winter of 1914-15.

Dysentery is said to have been an actual scourge in numerous regions of the war theatre, the field hospitals being packed with patients, especially near the Eastern front. Although no tried and tested vaccine was available, as for typhoid fever and cholera, some progress was made in Germany in regard to prophylactic vaccination against dysentery, with Boehnke's multivalent "dysbaeta." This vaccine is made from all bacteria now held responsible as pathogenic agents of dysentery and in the course of the war was employed for the inoculation of 15,000 persons, almost exclusively soldiers among whom the disease had appeared, or who were quartered in infected localities. In 86 per cent of the cases, the inoculation took an entirely uneventful course, without reaction of any kind. In only 1.6 per cent a rise of temperature followed, with vertigo, headache, local swelling at the site of inoculation, and diarrhea persisting for several days. In a general way, the reaction

was so inconsiderable that no precautionary measures were required. The treatment was administered in such a way that given amounts of the vaccine (0.5, 1.0 and 1.5 c.c. of dysbacta) were injected at intervals of five days. As an immediate sequel of the inoculation, latent infections manifested themselves, but after these had been eliminated, only a few sporadic cases of severe dysentery occurred among the inoculated troops. Slight intestinal disturbances were not uncommon, however, and must be interpreted as an attenuated dysentery. Soldiers who had not been inoculated, on account of leave of absence were often attacked by the disease. The inoculation evidently resulted in a relative immunity, but this does not apparently last longer than three or four months.

In spite of the enormous danger to health, incident to the masses of mobilized men, the existence of the troops under poor hygienic conditions, and the long duration of the war, Germany succeeded in maintaining her soldiers at a high standard of efficiency and in practically eliminating the horrors of the old war epidemics. This was accomplished by the capable organization of their Sanitary Corps and the hygienic knowledge of her medical men who proved themselves able to cope with the new and unaccustomed tasks arising out of the exigencies of modern warfare. German war hygiene aimed at introducing sanitary measures in the entire army, with the idea that if the vital conditions of the troops could be made hygienic by the removal of conditions likely to lead to the origin or distribution of disease, the general standard of health would be fairly high, and war epidemics would accordingly be deprived of the soil for extensive distribution. As a matter of fact, war diseases took a much smaller toll than in previous wars, the statistical data showing that Germany succeeded in keeping her armies free from epidemics and other diseases. The number of those killed by the enemy as compared to the number of those who died of disease equals about one-tenth. The proportion is readily seen by a glance at the following table, which shows the German losses:

World War	Deaths from wounds	Deaths from diseases
1914-19	1,531,048	155,913

SANITARY CONDITION OF THE GERMAN NAVY DURING THE WORLD WAR

The strength of the German Navy (including the Marine Corps, as well as the formations in Kurland, Livland, Esthland, Bulgaria, the Ukraine, and Turkey) is calculated, according to data obtained from the Medical Department of the Navy Administration (Reichs-Marine-Amt) as follows:

First war year, 202,123; second war year, 235,267; third war year, 254,347; fourth war year, 283,071.

Of these men, the following came under professional treatment: first war year, 96,894; second war year, 105,872; third war year, 112,276; fourth war year, 140,866.

These figures include war wounds as well as general diseases. Of all the wounded and sick who came under professional treatment, 836 died in the first year (0.86 per cent); 740 in the second year (0.69 per cent); 1,049 in the third year (0.93 per cent); and 1,448 in the fourth year of the war (1.03 per cent). Total deaths, 4,073. Up to August 1, 1918, 5,899 men had been discharged as unfit for service, including 516 who had lost one limb and 36 who had lost two or more limbs. The number of war-blind men amounted to 17 cases.

The incidence of pulmonary tuberculosis was approximately the same during the second, third and fourth year of the war, but the number of deaths increased considerably, from 11.1 per cent in the first year, 10.4 per cent in the second year, to 13.6 per cent in the third year and 18.4 per cent in the fourth year of the war.

MORTALITY IN THE GERMAN MEDICAL AND SURGICAL SERVICES DURING THE WORLD WAR

A special inquiry into the losses incurred by Germany during the World War in medical and surgical officers has resulted in the following figures, illustrating the unprecedented exposure of members of the profession to fatal war injuries. No less than 562 were killed in battle or died of wounds received in battle; 763 died from disease or other causes; bringing the total losses to 1,325. Germany has reason to point with pride to this record of the devotion to duty of those entrusted with the care of her wounded and disabled.

Whereas former wars took the toll of at most some hundred of thousands, the World War killed or maimed by the millions, so that in view of the tremendous numbers involved in the necessary calculations, it is not possible to give exact figures within a short time after the armistice. The realization of their losses is lightened for the Germans by the reflection that during the four years of the war, as stated by Schwiening, over ten millions of members of their armies (including the numerous wounded and sick who figured several times on the lists) were treated in all hospitals of the interior or near the front, with a survival of 97 per cent. For this truly remarkable result, seeing the many cases of severe traumatism and dangerous diseases, credit must be given to the German medical and surgical services. The greatest skill and most efficient organization naturally fail as regards the slain on the battlefield, but the excellence of their work is illustrated by the high percentage of recoveries from wounds and disease, as well as by

the low incidence of disease in their armies in general. An important chapter in the history of the World War is thus shown to be represented by the furtherance of medical and surgical knowledge under the spur of dire necessity, on the German as well as on the Allied side, for the healing art knows no national boundaries. Benjamin Franklin said that "mad wars destroy in one year the works of many years of peace." Medicine and surgery are perhaps the only exceptions to this rule, for under the stimulus of bloodshed and mutilations that clamor for repair, the germs of knowledge which otherwise might have taken many years for their development, often reach maturity overnight. Destructive war cannot leave where it found the disciples of a constructive science so essential to the relief of its ravages. Undoubtedly all the warring nations have learned their lessons, and the future may reveal more fully than is possible at the present time and in the limits of a brief report, to what extent German medicine and surgery have been furthered by these war-taught lessons.

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GENERAL SURVEY OF COMMUNICABLE DISEASES IN THE A. E. F.*

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AS can be seen by even a casual study of the reports of disease incidence and deaths in the A. E. F., the diseases transmitted through the respiratory tract played a predominant role as a cause of wastage of time and life. Limited to its simplest terms this seems to be explained best by the two important features which were inherent in our participation in a European war, namely, the crowding of men in ships, in trains, and in living quarters, made necessary by the call for speed and numbers, and the constant contact with carriers, i.e., the bringing into the most intimate of personal contact by reason of this crowding, of groups of men in ever changing relationship, so that every bearer of infectious micro-organisms had the maximum opportunity of conveying his particular variety to the largest possible number of his fellows. Alterations of personnel within organizations, expansion and dilution with newly arriving troops, replacements from common reservoirs of men at large depot camps, evacuations in mass, assembling of convalescents from hospitals for return rarely to the same group from which they came as patients, and exposure throughout England and France to dense civil populations, such were the peculiar complexities and excessive varieties of contact which contributed generously to the great prevalence of respiratory tract infections in the A. E. F.

There were no other special factors determining the occurrence or spread of other groups of diseases that are not commonly met with in civil life and in the ordinary vicissitudes of community existence.

It is, however, worth while to note particularly that, had not our army been protected to such a very high degree by compulsory vaccination against typhoid and para-typhoid, we should certainly have suffered from a severe visitation of these specific enteric infections such as afflicted the American forces in 1898, and as the French Army suffered in 1914 and 1915. In other words, although the conditions were favorable to the spread of respiratory affections, these same conditions would have developed equally serious epidemics of enteric disease if our men had not been so well protected by preventive inoculations.

Conclusions, estimates, and opinions based upon current study of disease incidence in the A. E. F. were subject to considerable error, owing to the important differences between such combat army experience and the experience in relatively stable populations with a fairly permanent location. The rapid alterations in strength of the A. E. F. as a whole, and of its larger component groups, the frequency of change in location of organizations, the constant change in designation and

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numbers of many of the elements in the S. O. S. troops, the fluid state of army tables of organizations all contributed materially to errors in epidemiological studies. The following data upon the communicable diseases are presented subject to the correction of figures which will be forthcoming from the Surgeon General's Office when the individual records of cases are finally coded and tabulated. The tables of case incidence and rates per 100,000 of strength were the actual working material upon which the medical department of the Army in the A. E. F. based its policies while the A. E. F. was assembling, during its active participation in the battles which led to victory, for the months after the Armistice while holding the Coblenz bridgehead, and during the return of the troops to the United States.

In spite of the fact that the current reports of the diseases in question (i.e., the diseases specified in Manual for Sick and Wounded Reports, Section XII) were not wholly accurate or prompt enough for epidemiological purposes prior to March 11, 1918, the completed hospital records of cases were subsequently so coded and tabulated in the office of sick and wounded that the statistical statement of incidence of the diseases can be accepted as of equal value before and after that date.

The official figures for the strength of the A. E. F. by months as of the middle of each month beginning July, 1917, are here given, as they are the basis for morbidity incidence per 100,000 strength, which will be used throughout this report.

The strength figures given out by G.-1, G. II. Q. and later by G.-1, Hq. S. O. S. for the first of each month are used as standard and approximately correct.

The monthly strength figure was calculated by adding to or subtracting from the strength given for the first of a month, half of the difference between this figure and the strength as given for the first of the next month.

A. E. F. Strength by Months

1917		1918		1919
July	15,553	January	188,652	1,806,033
August	26,703	February	229,316	1,661,000
September	44,744	March	286,521	1,479,000
October	70,079	April	437,063	1,200,000
November	106,090	May	503,265	
December	141,995	June	739,042	
		July	988,015	
		August	1,077,595	
		September	1,516,386	
		October	1,741,593	
		November	1,854,523	
		December	1,911,141	

Although in the case of measles, which up to June, 1918, was reported only by mail, and, therefore, reports were received two to seven days after actual diagnosis, and exceptionally in other diseases the reports were delayed, in the statement of incidence by weeks, which appear for the diseases below, the cases are recorded according to day of origin and not by the day of receipt of the report.

DIPHTHERIA

Weekly figures for diphtheria before December, 1917, are considered too unreliable to report, therefore only the monthly record of the disease is given for the first five months of the A. E. F. With such a small number of troops as formed the basis of our rate per hundred thousand strength from July to November, 1917, the exaggerated effect of a few cases in the organizations then in France and England leads to erroneous conclusions as to the prevalence of disease. A rate of 83.6 per hundred thousand strength for July, 1917, based on a strength of 15,555, is of much less reliability statistically than a similar rate in March, 1918 based on a strength of 286,521. The first important episode which gave a sudden rise in the diphtheria rate occurred in the week ending March 17, 1918, when the 32nd Division, arriving in France with a considerable number of cases, and the probability of numerous carriers in its component organizations, developed by the prevalence of diphtheria in its camp in the United States, passed from the base port across France to its training area between Dijon and Langres.

The 35th Division was the only other organization in the A. E. F. which, coming with such a definite history of diphtheria prevalent during training camp experience in the United States, developed widespread incidence of the disease for several months after its arrival in the A. E. F.

From the middle of June, 1918, until the dissolution of the A. E. F., the incidence rate of diphtheria varied but little from week to week, and the epidemics that occurred were local in area and small in numbers.

The epidemic of influenza may have been a factor in causing a general rise in diphtheria in the weeks from October 13 to December 15, 1918, but, regardless of influenza, these are months when diphtheria is apt to prevail.

There were many observations indicating that gas intoxication of sufficient intensity to cause lesions of the throat and larynx caused a predisposition to diphtheria. On the other hand, it is quite possible that the reason for the spread of diphtheria among gassed men was that the sloughing and membranous lesions, the results of excoiations, were not frequently examined for the bacillus diphtheriae, and thus cases and carriers were developed without early control.

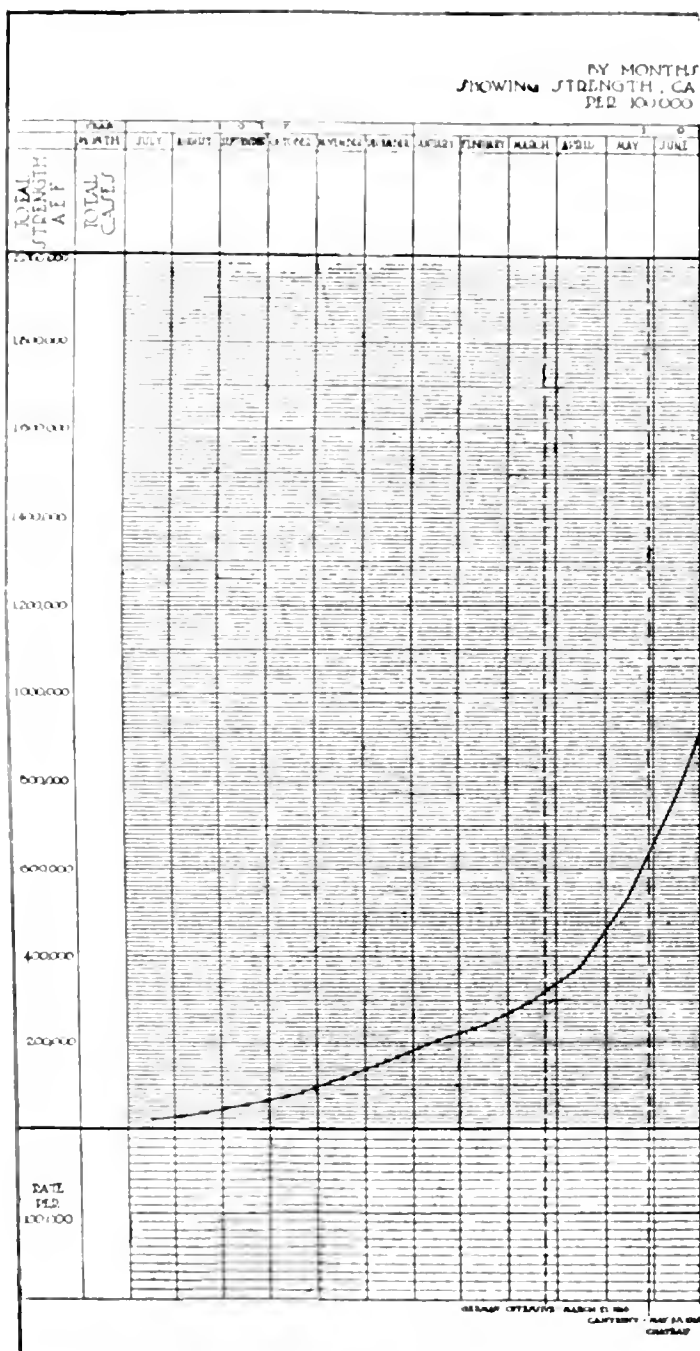


CHART A.--This standard chart was prepared and used in the A. E. F. by the office of epidemiology to present and records in a graphic form the following items, by months:

1. The strength of the A. E. F., at all times a rapidly fluctuating population unit.

1 0 1 0										YEAR			
JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	TOTAL CASES	TOTAL LENGTH A.F.
												2,000,000	
												1,800,000	
												1,600,000	
												1,400,000	
												1,200,000	
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												800,000	

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At the Mesves hospital center especially, and to some degree in other hospitals, wound diphtheria was found in considerable numbers under such conditions that infection of wounds by carriers among hospital personnel was considered probable in the majority of cases.

A full report of the experience at Mesves has been published in medical periodicals, the most interesting observations being that infection of wound surfaces with the diphtheria bacillus does not generally exhibit the characteristic toxemia of the disease, nor is the development of the bacillus in wounds materially affected by the use of antitoxin therapeutically.

A total of 4,714 cases of diphtheria and 62 deaths were reported between July 1, 1917, and April, 30, 1919, inclusive, giving a case mortality per cent of 1.3. The case mortality in the French Army (Zone of Army and Interior) was 1.61 per cent, Jan. 1915-Oct., 1918.

The monthly diphtheria incidence rates per hundred thousand strength in the British Expeditionary Forces and in the French Armies were at all times far below the rates of the A. E. F.

In the British Expeditionary Forces in 1915 the monthly rate per 100,000 ranged from 2.6 in July to 9.0 in February, averaging 5.1 for the year. In 1916 the lowest monthly rate was 3.1 in April, the highest 11.8 in November, with an average for the 12 months of 6.7. In 1917, the lowest monthly rate was 6.5 in November, the highest 13.5 in March, with an average for the 12 months of 9.7. From October, 1918, to April, 1919, inclusive, the rate varied between 3.2 in October to 9.8 in November, with an average rate of 7.3 for these 6 months.

The reports from the French Armies are divided into case incidence in the Zone of the Armies and case incidence in the Interior. The monthly incidence rates for diphtheria for 100,000 strength in the Zone of the Armies varied in 1917 from 5 to 7, in 1918 from 4 to 8, in 1919 from 2 to 7. The comparable rates for troops in the Interior were in 1917, 16 to 29, in 1918, 17 to 38.

The incidence rates for diphtheria in the A. E. F. per 100,000 of strength by months were:

1917		1918		1919	
July	83.6	Jan	9.0	July	25.4
Aug	37.5	Feb	20.1	Aug	33.8
Sept	40.3	Mar	92.9	Sept	20.6
Oct	11.4	Apr	53.1	Oct	19.6
Nov	4.7	May	65.4	Nov	26.3
Dec	12.7	June	45.0	Dec	25.0
				Jan	21.1
				Feb	22.7
				Mar	22.4
				Apr	16.3

Both the British armies as a whole, in France and Belgium, and the French troops in the Zone of the Armies escaped, because of the scattered

character of civilian population in the occupied territory, such a degree of contact with, and infection from, the French civilian population as our troops were exposed to.

Comparison between our case incidence of diphtheria and its incidence among the French troops in the Interior would be more profitable and just. The average French rate for diphtheria per 100,000 troops in the Interior for July-December, 1917, was 19.5; for the A. E. F., 34.3. The comparable French rate for 1918 was 30.5; for the A. E. F., 23.1.

MALARIA

No cases of malaria were reported in the A. E. F. before June, 1918. Between June, 1918, and February, 1919, inclusive, 851 cases of malaria were reported, with four deaths. The cases were distributed as follows:

1918		1919	
June...	61	January...	41
July...	94	February...	18
August...	136	March...	22
September...	200	April...	28
October...	128		
November...	81		
December...	42		

The four deaths were reported in July and September, 1918, and in January and March, 1919.

One of the deaths occurred almost immediately after arrival, at a port in England, of the patient whose condition had been diagnosed as acute jaundice on shipboard.

The first cases which were reported in June, 1918, were undoubtedly recrudescences of the disease in men who had been enlisted from the Southern States (Alabama), where the disease is prevalent, since the time of year and location of the organization precluded any recent new infection by anopheles.

It is, of course, a bare possibility that some of the cases of malaria were of indigenous origin in France, since malaria has been brought to and distributed in France rather widely by infected men invalided home from Saloniki. The anopheles breeds rather widely, but not vigorously or abundantly, in France, and the night time is usually so cool, even during the breeding season for mosquitoes, that they are not very active or aggressive, even where they can be found on the wing in the parts of France mostly occupied by our troops.

It may be taken for granted that our troops brought their malaria with them, that they did not spread it among themselves or in the civil population in France or England, and that the fatigues and exposures of

their various occupations were chiefly responsible for the development into clinical manifestation of the great majority of the cases reported.

MUMPS

In terms of sick wastage, and measured by the number of days lost from military service on account of sickness, mumps was the most important disease in the A. E. F. Approximately 1,021,636 days were lost from service on account of mumps. Between July 1, 1917, and April 30, 1919, inclusive, 81,899 cases and 43 deaths from mumps were reported. They were distributed by months as follows:

		<i>Cases</i>	<i>Deaths</i>
1917	July.....	236	....
	August.....	337	....
	September.....	307	....
	October.....	330	....
	November.....	980	....
	December.....	2,302	....
1918	January.....	5,835	....
	February.....	5,245	....
	March.....	3,805	....
	April.....	1,155	....
	May.....	1,500	....
	June.....	1,709	....
	July.....	3,626	1
	August.....	8,359	....
	September.....	5,674	3
	October.....	7,694	8
	November.....	8,076	21
	December.....	10,938	....
1919	January.....	8,901	5
	February.....	4,160	1
	March.....	3,973	4
	April.....	1,697	....
Totals.....		81,899	43

The monthly incidence rates for mumps per hundred thousand strength in the A. E. F. and among the French troops in the Zone of the Armies and in the Interior are as follows. (There are no reports of mumps available from the B. E. F. at present.):

1917	A. E. F.	French Zone of the Army	French Zone of the Interior
July.....	1,517	33	179
August.....	1,262	31	119
September.....	686	25	99
October.....	477	29	127
November.....	916	35	89
December.....	1,621	45	154

1918	A. E. F.	French Zone of the Army	French Zone of the Interior
January.....	3,103	79	291
February.....	2,289	93	277
March.....	1,328	112	261
April.....	262	129	210
May.....	298	110	232
June.....	231	39	274
July.....	367	37	251
August.....	311	28	164
September.....	734		
October.....	441		
November.....	435		
December.....	573		
<hr/>			
1919			
January.....	492		
February.....	250		
March.....	268		
April.....	141		

Just as with us, the French rate depended upon the presence among the troops of new recruits who had not been previously exposed to the disease, or at least had had no previous attack. The enrollment of each new class of recruits caused an immediate increase in the rate, as can be seen in the first five months of 1918. This increase in rate among the French troops appeared first and to the greatest degree among those in the Interior, and affected the rate of the troops in the Zone of the Armies in proportion to the numbers of new recruits who were sent to this zone before they had passed through an immunizing attack of the disease. The case mortality from mumps in the French Army (Zone of Army and Interior) was 0.12 per cent, Jan., 1916-Oct., 1918.

A case mortality per cent of 0.05 and a loss of 43 lives attributed, but probably not really due, to mumps uncomplicated by some other condition, may seem an unimportant loss in an army of the size of the A. E. F., but the loss of time, work, service, and what it represented in money spent and loss of effective force in battle or in supply services, due to the segregation and care of 81,899 men for an average of 12.5 days each is well worth every effort to prevent, avoid, or diminish, so far as possible. The prolonged incubation period, the long and uncertain period of infectivity, our ignorance of the virus or etiologic agent and its mode of usual conveyance, and the very general susceptibility of young adult males when well exposed, all combine to defeat the measures of segregation usually employed. It may be presumed that a manner of living and quality of personal hygiene which will prevent the widespread smearing of all objects within the ordinary reach and range of

man with salivary discharges will go far towards arresting the spread of mumps among troops. Certainly research which will clear away some of the uncertainties of origin, mode of conveyance, diagnostic points, early in the disease, etc., would add considerably to the determination, now almost wholly lacking, to take effective measures against this disease. Mumps is an important disease in young armies.

MEASLES

There were reported 8207 cases and 86 deaths from measles between July 1, 1917, and April 30, 1919 in the A. E. F., giving a case mortality of 1.05 per cent. The case mortality from measles in the French Army (Zone of Army and Interior) was 1.32 per cent, Jan., 1916–Oct., 1918.

The high incidence rates in the first months, up to and including January, 1918, as compared with the rates after that are probably to be explained by the fact that among the troops which came over before the Spring of 1918 there was a very much higher percentage of men who had not been through exposures to, and epidemics of, measles in the training camps in the United States than was the case with troops arriving in the A. E. F. after February, 1918.

In the first 18 months of the A. E. F. measles was very largely confined to troops just arriving at Base Ports, or to detachments of these new-comers at the replacement camps, or even among the army units, to which they were often hastily forwarded without even being held to pass the incubation period, although they may have been known to have been exposed during the voyage to infection on shipboard.

Between 50 per cent and 80 per cent of all cases in the A. E. F. from week to week up to the signing of the Armistice were reported from the Base Ports. The incidence of the disease varied widely from week to week, according to arrivals of transports or convoys.

After the discontinuance of new troop arrivals, and with the greater stabilization of commands as to location and personnel, measles played but an insignificant part in disease incidence in the A. E. F., and nowhere developed any important epidemics. There is no reason to believe that measles in the A. E. F. was to any noticeable extent due to infection acquired from the French civil population. What cases there were after January 1, 1919, were chiefly in the other parts of the A. E. F. than the base ports, especially in the Armies and in the Advance section.

Although pessimism was often expressed by medical officers with regard to the possibility of preventing the spread of measles in an organization where there were known to be many susceptibles, it was demonstrated on more than one occasion that early recognition of the first catarrhal and oral symptoms of the disease, by daily or twice-daily

medical inspections of eyes, throats, and bared chests, and segregation of all cases and suspects, supplemented by enforcement of the routine hygiene and sanitation found necessary to control and prevent all types of respiratory infections, could and did bring measles outbreaks to an abrupt end within ten days. It was not found at all necessary or justifiable to accept the universal susceptibility to measles, and the extreme contagiousness of the infection as an excuse for omitting any or all precautions, but rather as a challenge to employ all in full confidence that the disease can be controlled.

Comparison with the incidence rates of measles per 100,000 per month in the armies of our British and French allies shows, as in diphtheria, very much higher rates in the A. E. F. For the French troops in the Zone of the Armies the rate in 1917 varied between 2 and 7, for the troops in the Interior from 31 to 147; in 1918 the rates in the Army Zone were 10. to 21., in the Interior 49. to 464., the latter high rate resulting from recruiting the class of the youngest new troops.

In the B. E. F. the monthly rates from October, 1918, to April, 1919 (the only figures available at the time of writing), varied between 2.7 and 16.0 per 100,000 strength.

The incidence rates for measles in the A. E. F. per 100,000 of strength per month were:

1917	1918	1919
July..... 145 2	Jan..... 358	July..... 27 6
Aug..... 118 1	Feb..... 14 4	Aug..... 55
Sept..... 179 6	Mar..... 42	Sept..... 73 6
Oct..... 225 2	Apr..... 22 6	Oct..... 64 6
Nov..... 463 5	May..... 44 5	Nov..... 53 6
Dec..... 359 6	June..... 42 3	Dec..... 20 8

The relative youth of our troops, the recruiting of so many of them from parts of the United States where measles was less universal than it is in childhood in France and England, and the extensive contact of our troops with civilian populations in England and France, are thought to explain such excessive rates as prevailed in the A. E. F. in comparison with those of the British and French.

Measles as a precedent to or contributing cause for pneumonia played a very unimportant role in the A. E. F., as can be seen from the case mortality of the disease. Pneumonia following measles was rare in the A. E. F.

SMALLPOX AND CHICKENPOX

Thirty cases and five deaths from smallpox were reported in the A. E. F., while there were 289 cases of chickenpox reported. The distribution of these diseases by months was as follows:

		<i>Smallpox</i>		<i>Chickenpox</i>
		<i>Cases</i>	<i>Deaths</i>	<i>Cases</i>
1917	July	1		
	August			
	September	1		
	October			
	November			
	December			3
1918	January			17
	February	1		5
	March	1		9
	April	3	1	13
	May	2		19
	June			14
	July			12
	August			16
	September	1	1	16
	October	1	1	28
	November	2		18
	December	9		18
1919	January	2		20
	February	4	2	20
	March	1		33
	April	1		28
Totals		30	5	289

With the exception of four cases in February, which developed among hospital personnel after exposure for several days to a case of smallpox which had been considered to be chickenpox, no two of the cases of smallpox reported occurred in such relation to each other in time, place, or organization, as to make it seem at all probable that there had been infection from one case to others in the A. E. F. series, or that the infection in any two or more of our cases had come from a common source in the civilian population. There is always a small amount of smallpox in France, the military alone being uniformly vaccinated.

The first death from smallpox was of an officer who was exposed to the disease while suffering from mumps, a delirious smallpox patient in the same hospital having escaped from his attendants and entered the officer's sick room. The officer was not revaccinated at the time of the exposure, and he was not previously adequately protected to prevent a fatal attack of the disease. One of the other deaths was of a nurse, one of the four hospital personnel who had been exposed to the supposed chickenpox case. The nurse had gone on leave before the true diagnosis of the case of smallpox had been made. She returned by a long exhausting railroad journey to the hospital suffering severely from the constitu-

tional symptoms, and with a typical smallpox eruption widely distributed on face and hands. No secondary cases are known to have resulted from the exposure of her fellow travelers.

The object of requiring the telegraphic report of cases of chickenpox on the day of diagnosis was to call the attention of medical officers to the importance of this diagnosis in adults, in spite of the unimportance of chickenpox *per se* in the army. To be on guard against making a false diagnosis, to be ready at all times to consider a case of chickenpox in adults as possibly smallpox, or even probably so until proved the contrary, in such ways is an early diagnosis of smallpox, when it does occur, better assured. Such cases of smallpox as occurred in the British and French armies were rare and widely scattered. Cases of chickenpox were not the subject of mutual report between the armies.

MENINGOCOCCUS MENINGITIS

There were no extensive epidemics of meningococcus meningitis in the A. E. F., although a number of organizations in which the disease had prevailed to a serious degree in training camps in the United States continued to show relatively high incidence and to give evidence, from the way the cases developed, that carriers were numerous and the organism virulent. High carrier rates were rarely found, and certainly not in such relation to high case incidence in an organization as to justify the belief that the presence of carriers compared in importance with the alterations in susceptibility, through which groups of men passed apparently as a result of changes in environment, occupation, and climate. Crowding, extreme fatigue, cold, wet, exposure, inadequate food, and unsuitable food, all appeared to play important parts in developing increased susceptibility to meningitis.

Rarely were cases so grouped that one case could be shown to have originated from another among his mess-mates, his company, or other companions. Scattered distribution in large organizations was the rule, even in divisions where the disease was relatively prevalent.

It was commonly noted that more than 50 per cent of the cases reported in any week, up to the cessation of troop shipments from the United States, were reported from the Base Ports, and in most of the cases the infection originated and often developed upon shipboard, where the allowance of floor space per capita on troop decks was frequently not more than 9 square feet.

The high rate of incidence in the A. E. F. in November, 1917, was due to outbreaks in organizations which brought the disease with them from their training camps.

The high rate in October, 1918, followed three weeks after the highest incidence of influenza, and it was considered probable that the wide-

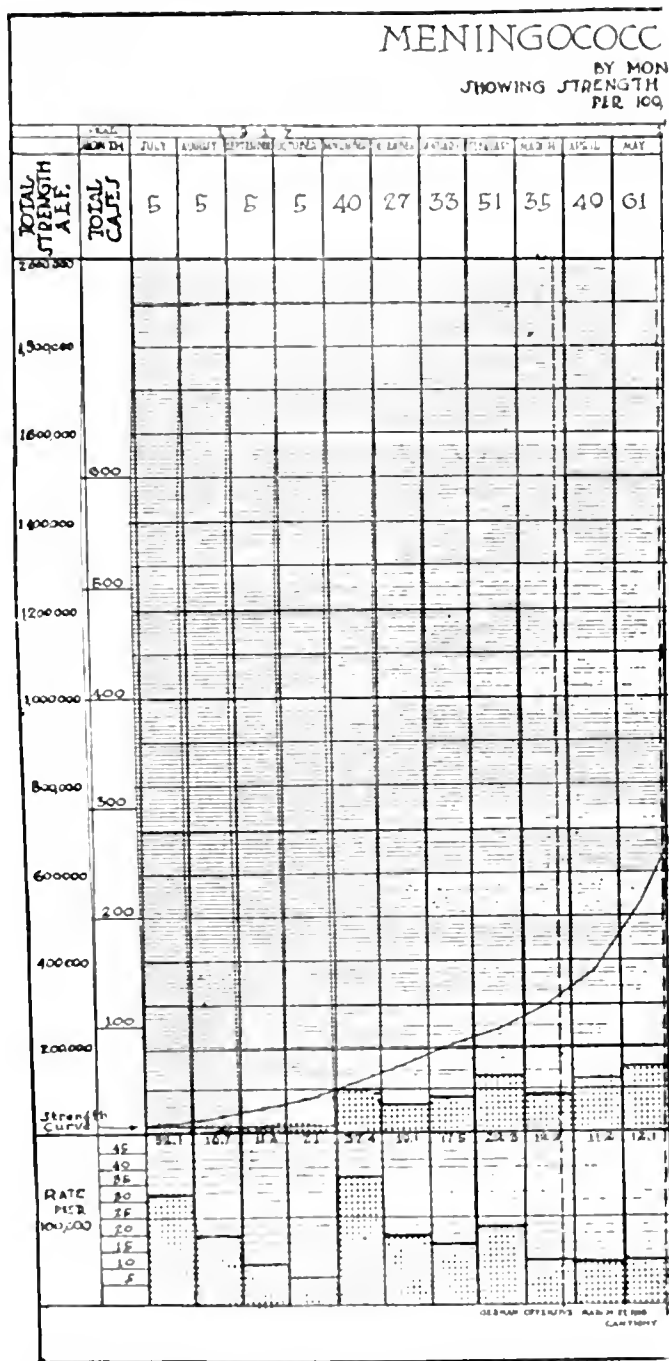


CHART B—This chart represents graphically in shaded columns, and actually in figures, the experience of the A. E. F. with Meningococcus Meningitis as it occurred by months from July, 1917, to May, 1919, and the relation of case incidence

spread lowering of resistance, apparently to various infectious diseases, resulting from influenza, the prevalence of upper respiratory tract inflammations of a great variety accompanying or following influenza, the continuous inclement, cold, wet weather, the serious overcrowding of most of the quarters provided for troops in the A. E. F. in France, and the exhaustion of many of the combat troops incident to the extreme battle activities, all contributed to the sudden increase in meningitis at this time.

Control of meningitis in the few instances where there were local groups evidently originating from common contact with carriers or cases, as in hospitals, and more rarely in barracks, was successfully based on more generous spacing out of the beds or bunks of the unit or group affected; on punctilious observance of the sterilization of mess kits; the ventilation of all meeting, eating, and sleeping places; the avoidance of use of common eating and toilet articles, etc., and upon an intelligent selective search for carriers. Wholesale carrier examinations were rarely found to be necessary or helpful.

During the various waves of influenza, from April, 1918, to March, 1919, there were many erroneous provisional diagnoses of meningitis in cases where the onset of influenza was instantaneous, with severe fulminating symptoms, often of meningeal type. Cases in several instances appeared to be so typical of meningitis that antimeningococcus serum was given without waiting for microscopic or bacteriological examination of blood or spinal fluid. As was to be expected, much meningitis was discovered among patients admitted to hospitals during the height of the influenza epidemic as influenza patients. Throughout the fall and winter of 1918 and 1919 one of the most important of the problems of medical officers in the field and in hospitals was to accomplish, as early as possible, segregation of infected from well men, and of cases of one kind of respiratory tract infection from cases of other kinds.

There were a total of 1965 cases of meningococcus meningitis reported from July 1, 1917, to April 30, 1919, inclusive, and 911 deaths, giving a case mortality of 46.14 per cent. The case mortality from meningitis in the French Army (Zone of Army and Interior) was 32.61 per cent January 16 October 18.

Comparison between monthly incidence rates per 100,000 strength in the A. E. F. and those in the British E. F. and in the French armies shows almost constantly higher rates in our forces.

In the B. E. F. in 1915 the monthly rates for cerebrospinal meningitis per 100,000 strength varied between 1.6 in September and 15.0 in March, with an average rate of 5.05. In 1916 the rates were from 0.8 in November to 4.3 in April, with an average of 2.25. In 1917, the rates were

from 0.5 in October to 7.4 in March, with an average of 3.04. In 1918 the rate for the last three months of the year were 0.3, 0.2, and 0.3, respectively. In 1919 the rates were January 0.6, February 0.3, March 0.4, and April 4.6.

In the French armies in the Zone of the Armies the rates in 1917 (July-December) were from 0.2 in October to 0.9 in December, with an average of 0.48 for the 6 months. In 1918 the rates were from 0.2 in January to 1.0 in February, March, and April, with an average of 0.83 for the twelve months. In the first four months of 1919 the rates were 0.3, 0.8, 1.8, and 0.7, respectively, with an average of 0.9 for the four months.

For the French troops in the Interior the rates in 1917 (July-December), were from 2.0 in August and September to 5.0 in November and December, with an average of 3.3 for the 6 months.

In 1918 (January-August, inclusive), the rates were from 2.0 in April to 12.0 in May, with an average rate of 7.14 for the seven months.

SCARLET FEVER

Scarlet fever has not been considered in the past to be of much importance as a problem in armies, but for much the same reasons as have been presented in the report upon measles and mumps in the A. E. F., scarlet fever in our young army of young men, in large numbers drawn from sparsely settled or rural communities, developed considerable incidence, and persisted to some extent at all times.

Among the first large organizations which arrived in France, there was one which developed a considerable epidemic of scarlet fever in November and December, 1917. The cases were left at numerous places en route across France, and many small villages received legacies in the shape of local epidemics in the wake of the passing troops.

In the spring of 1918, also, there were several localized outbreaks among newly arrived troops in which the infection was traced with approximate accuracy to the presence of infection on shipboard, brought directly from the camps where it had existed in the organizations just prior to embarking. Here, again, the necessity for speed and the limitation of space in transports and trains were the special factors contributing to the spread of the infection.

The disease was always easily controlled by adequate frequent medical inspection of contacts, and segregation of cases and suspects.

There were reported from July 1, 1917, to April 30, 1919, inclusive, 2,064 cases of scarlet fever and 70 deaths, giving a case mortality of 3.39 per cent. The case mortality of scarlet fever in the French Army (Zone of Army and Interior) was 1.77 per cent, Jan. 1916-Oct. 1918.

Comparison with the monthly incidence rates per 100,000 strength in the armies of our Allies shows our scarlet fever rate to have been higher than theirs. In the B. E. F. the rates for October, November, and December, 1918, were 0.9, 1.8 and 1.1, respectively, and in the first four months of 1919 they were 1.5, 0.8, 1.3, and 1.8, respectively. (No other data upon the incidence of scarlet fever in the B. E. F. are at present available, although from reliable sources, A. D. M. S. Sanitation Hq., L. of C., B. E. F., it was learned that the rate never varied much and was always very low as recorded above).

In the French troops in the Zone of the Armies the rates in 1917 (July–December, inclusive) ranged from 2.0 to 4.0 averaging 2.5 for the six months. In 1918 the rates in the Zone of the Armies were from 1.2 in December to 9.3 in October, with an average monthly rate for the 12 months of 4.09. In the first four months of 1919 the rates were 2.0, 6.9, 9.2, and 8.7, respectively.

For the French troops in the Interior the rates in 1917 (July–December, inclusive) were from 15.0 in November to 25, in July, with an average monthly rate for the 6 months of 19.8. For the first seven months of 1918 the rate for the troops in the Interior were from 24.0 in February to 90 in June, with an average monthly rate for the 7 months of 49.8.

The incidence rates for scarlet fever per 100,000 of strength by months were:

1917		1918		1919	
Sept.....	11.2	Jan.....	64.8	July.....	19.4
Oct.....	39.9	Feb.....	44.8	Aug.....	6.7
Nov.....	51.4	Mar.....	51.8	Sept.....	4.6
Dec.....	93.8	Apr.....	54.7	Oct.....	6.0
		May.....	33.4	Nov.....	5.2
		June.....	15.3	Dec.....	6.7

DYSENTERY

Owing to the loose clinical use of the term dysentery there were many cases reported under this heading for which no supplementary information as to specific etiology was received. The great bulk of the ordinary diarrheas were treated, or recovered, without hospital care. Since the type of enteric disease, a widely prevalent epidemic diarrhea, which prevailed from July through September, 1918, in the A. E. F. and particularly among the troops which took part in the Chateau Thierry offensive, was benign and of brief duration, and since the emergencies of combat, evacuation and hospitalization forbade the use of hospital care for any but serious cases, there can be offered only estimates of the incidence of this affection, based upon reports of medical officers with troops, or of those sent out from the Central Medical Laboratory

to study the situation and direct preventive measures. It is estimated that not less than 150,000 cases of diarrhea occurred in the First Army in July and August, 1918.

Where examinations of stools could be made early in the disease it was common to find the usual dysentery bacilli, and in a considerable number of cases the bacilli of typhoid and paratyphoid were identified as the cause of what had been supposed to be a simple acute enteritis. The more severe and persistent cases of diarrhea, and those complicating the various battle casualties, which reached hospitals, often when examined did not show at such a late stage of the disease specific organisms which could properly be considered the cause of the disease. It will be seen from the foregoing that any statistical statement of dysentery in the A. E. F. must be of but relative completeness and accuracy, and not at all comparable to the reports of this disease among the British, where every case reported as dysentery had been proved by bacteriological methods. The records of the disease in the French armies also were based on reports confirmed by laboratory examination of stools.

There were reported from July 1, 1917, to April 30, 1919, inclusive, 6,195 cases of dysentery, of which 5,261 lacked laboratory confirmation of the diagnosis. Of the 934 cases, for which laboratory proof of the diagnosis was presented, 38 were of amebic origin and 896 were due to one or more of the dysenteric bacilli, of which many well known and rare varieties were identified.

Of the amebic cases, the great majority gave a history of a previous attack, or of residence in the United States or in the tropics, where the disease is known to be prevalent.

No cases of infection probably acquired from local French civilian sources were reported. Amebic and bacillary dysentery are fairly common in all parts of France, but no serious epidemics or foci of either kind of dysentery were reported in the French civil or military population during the period under discussion.

The distribution of the proved and undetermined cases of dysentery reported by months was as follows:

	<i>Proved</i>	<i>Undetermined</i>
1917 July		
August		
September		
October		
November		
December		
1918 January	4	
February	2	
March	2	
April	4	
May	2	
June	1	37
July	48	111
August	194	322
September	312	854
October	181	1,547
November	72	1,461
December	38	347
1919 January	17	356
February	22	93
March	15	88
April	15	45

There were thirty-one deaths attributed to dysentery between July 1, 1917, and April 30, 1919, (giving a case mortality of 0.50 per cent) of which one was amebic in origin, five were bacillary and the rest (25) were of undetermined origin. These deaths were distributed as follows:

	<i>Amebic</i>	<i>Bacillary</i>	<i>Undetermined</i>
1918 August	1		4
September		3	6
October			10
November			3
December			1
1919 January			1
February			
March			
April		2	
Totals	1	5	25

The case mortality of dysentery in the French Army (Zone of the Army and Interior) was 3.37 per cent, January, 1916–October, 1918.

The monthly incidence of dysentery per 100,000 strength among French troops in the Zone of the Armies in 1917 varied between 5 and 7 for the last 6 months of the year. In 1918 it ranged from 2 in May to 49.2 in September, with an average monthly rate for the 12 months

of 13.6. In the first four months of 1919 the rates were 2.6, 2.4, 0.6 and 0.3 respectively.

For the French troops in the Interior the rates for the last six months of 1917 were from 9 in July to 97 in October, with an average for the six months of 43.8.

In the first seven months of 1918 the rate ranged from 5 in May and June to 105 in August, with an average for the seven months of 26.6.

TYPHOID AND PARATYPHOID

There were reported in the A. E. F. between July 1, 1917, and May, 31, 1919, inclusive, 1,242 cases of typhoid fever with 155 deaths, giving a case mortality of 13.2 per cent, and 169 cases of paratyphoid with four deaths, one from paratyphoid A and 3 from paratyphoid B, or a case mortality of 2.4 per cent, and a case mortality for the two diseases combined of 11.28 per cent. The case mortality of typhoid and paratyphoid fevers combined in the French Army (Zone of Army and Interior) was 9.76 per cent, January, 1916 October, 1918. The cases and deaths in the A. E. F. were distributed by months as follows:

	<i>Typhoid</i>		<i>Paratyphoid</i>	
	<i>Cases</i>	<i>Deaths</i>	<i>Cases</i>	<i>Deaths</i>
1917 July.....				
August.....				
September.....				
October.....				
November.....	2			
December.....		1	6	
1918 January.....	2	1	1	
February.....		2		
March.....			1	
April.....	4	2		
May.....	1			
June.....	8		1	
July.....	109	2	1	
August.....	45	10	5	
September.....	59	12	16	1-A, 2-B
October.....	43	7	8	
November.....	70	12	16	1-B
December.....	161	25	28	
1919 January.....	232	33	33	
February.....	169	9	9	
March.....	212	35	35	
April.....	92	4	7	
May.....	33		2	
Totals.....	1,242	155	169	4

There is no question in the minds of those who followed the development, course, and subsidence of typhoid fever from July, 1918, to May,

1919, that up to January 1, 1919, there were many cases of typhoid and paratyphoid fevers which were not recognized or reported as such. There were several important reasons for this, among which three require special mention. During the extensive prevalence of epidemic diarrhea, in July to September, 1918, in the areas over which the advancing battle line was sweeping from Chateau Thierry to St. Mihiel and beyond, there were enough cases of typhoid and paratyphoid detected almost accidentally in the course of diagnosis and treatment of the few cases of so-called dysentery which reached hospitals, to indicate a pretty generous seeding of these diseases among the great mass of benign non-specific enteritides. Later also when the organizations which had been particularly afflicted with diarrhea in the Argonne were searched for carriers of typhoid and paratyphoid, such numbers were found as to suggest a considerable prior undetected incidence of these diseases.

During the overwhelming epidemic of influenza which coincided during September, October, and November with the period of the maximum A. E. F. participation in combat, all conditions were favorable for the overlooking of enteric affections in the mass of acutely sick men, of whom 99 of every hundred were suffering from influenza or pneumonia. Battle casualties and the most serious medical emergency of the A. E. F. combined to put such a strain on medical and nursing personnel, and on hospitalization and laboratory facilities, that thorough searching clinical study and diagnosis of all patients were impracticable. That there were a considerable number of typhoid and paratyphoid patients at this time who went through their diseases to a spontaneous recovery we can fairly surmise from the fact that during the months of December, 1918, and January and February, 1919 a large number of patients came under hospital care in a convalescent or carrier stage of typhoid or paratyphoid fever whose history made it quite clear that the onset and early stages of their diseases had been mistaken and treated for and as influenza, often as long as eight weeks earlier.

The attitude of medical officers throughout the A. E. F. was a further important contributing cause of delay or failure to detect and report typhoid and paratyphoid fevers, even when all the evidence—clinical, bacteriological, and finally at autopsy—was overwhelming in forcing one to a diagnosis of these diseases. Intestinal type of influenza, subacute enteritis, chronic dysentery, and many other possible but improbable diagnoses served to disguise the true presence of typhoid. It seemed to be so deeply impressed upon the consciousness of the average medical officer that typhoid fever would not be encountered in our

presumably 100 per cent vaccinated army that they were deaf to histories and blind to the symptoms of classical cases of the disease.

The educational propaganda made necessary by the steadily increasing incidence of typhoid up to January, 1919, bore fruit in the submission of a larger number of suspected and clinical cases of typhoid before laboratory examinations had confirmed or disproved the diagnosis. So it was that from January to May, 1919, there were many cases of typhoid fever carried as true cases on the record in spite of inadequate evidence of the specific nature of the infection.

Only the final analysis of all histories after completion of the cases will eliminate errors of diagnosis in preparing records for tabulation and rates.

In the record of typhoid incidence in the A. E. F. there were three important episodes; First, the outbreak in the Camp Cody June Automatic Replacement Draft, which arrived (250 men) early in July, 1918, and developed 98 cases of typhoid fever; second, the development of a widespread occurrence of the disease in November and December, 1918, and January, 1919, in the divisions which had shared in the Argonne-Meuse offensive, and more particularly in the 77th Division when it reached its training area in the Advance section, and among the personnel of a number of hospitals in the advance section, and, third, an outbreak at Marseille in March in a Motor Traction Park. These and many coincident and less serious episodes which were studied in great detail will be found fully described by other authors. It would be superfluous to describe here the probable and proved causes of origin and spread of typhoid and paratyphoid in the A. E. F., but it is worth noting that the usual and well-known causes prevailed and operated to start and continue the epidemics, and that well tried sanitary and technical laboratory procedures sufficed to bring the outbreaks to an end.

Unusual and special exposure of our troops to typhoid and paratyphoid infection occurred in the area of France in the vicinity of Gondrecourt and Commercy, where these diseases had prevailed in the civilian population since 1915, where civilian cases were found frequently in the villages used for billeting of our troops, carriers, and heavily polluted village and house water sources being abundant, and in the occupied area of Germany in and about Coblenz, Trier, and along the valley of the Rhine, where for generations typhoid and paratyphoid have remained endemic in spite of persistent and intelligent efforts of the German public health authorities to eradicate them.

Probably the inoculation of our entire force with the triple typhoid—paratyphoid vaccine played the most important role in preventing these

diseases from developing into serious epidemics such as afflicted the Australians at Gallipoli, and the French in 1914 and 1915 in France.

The only rates for typhoid in the B. E. F. available at the time of writing are monthly rates per 100,000 strength for the months of October, 1918, to April, 1919, inclusive, which were October, 0.3; November, 0.3; December, 1.4; January, 1.0; February, 0.4; March, 0.6; April, 0.4.

Among the French armies in the Zone of the Armies the monthly rates per 100,000 strength ranged in 1917 (July–December) from 4.0 in December to 8.0 in September, with an average for the 6 months of 5.7; in 1918 from 0.6 in November to 6.0 in June, with an average for the 12 months of 2.4; in 1919, January, 0.6; February, 0.9; March, 0.6; and April, 0.0.

Among the French troops in the Interior the monthly rates per 100,000 strength ranged in 1917 (July–December) from 14.0 in December to 60.0 in October, with an average for the six months of 29.0; in 1918 (January–August inclusive) from 7.0 in April, May, and June, to 28 in August, with an average for the 7 months of 12.4.

The incidence rates for typhoid fever in the A. E. F. per 100,000 of strength by months were:

1917		1918		1919	
July	0 0	Jan.	1 0	July	11 0
Aug.	0 0	Feb.	0 0	Aug.	4 2
Sept.	0 0	Mar.	0 0	Sept.	3 9
Oct.	0 0	Apr.	0 92	Oct.	2 9
Nov.	1 8	May.	0 20	Nov.	4 5
Dec.	0 0	June	1 1	Dec.	13 0

TUBERCULOSIS

A special report upon tuberculosis will be found elsewhere prepared by the Chief Consultant in Tuberculosis.

Between July 1, 1917, and April 30, 1919, there were 4,201 cases of tuberculosis of all kinds and 433 deaths reported in the A. E. F.

Of these 2,113 were acute military tuberculosis; 102 were tuberculosis of bones or joints; 735 were incipient pulmonary tuberculosis, and 1,251 were chronic pulmonary tuberculosis.

Of the deaths 225 were from acute military tuberculosis; 3 were from tuberculosis of bones or joints; 99 were from incipient pulmonary tuberculosis, and 106 were from chronic pulmonary tuberculosis.

The distribution of the cases and deaths by months were as follows:

Year	Acute miliary tuberculosis		Tuberculosis of bones and joints		Incipient pulmonary tuberculosis		Chronic pulmonary tuberculosis	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
1917:								
July.....							10	
August.....			5				10	
September.....	5				2		17	
October.....	5				5		12	
November.....	7	2			5		62	
December.....	7	1	2				82	3
1918:								
January.....	20	2	10				191	3
February.....	15		5		2		100	1
March.....	15	4	2		5		30	7
April.....	7	2			2		8	7
May.....		4				2		2
June.....	76		7		27	6	94	6
July.....	64	5	5		35	2	120	
August.....	92	6	14		33	2	78	3
September.....	172	10	4		53	5	99	7
October.....	212	26	6		47	4	69	12
November.....	198	17	9		36	2	52	4
December.....	266	23	7	1	75	6	67	16
1919:								
January.....	280	33	11		103	15	71	13
February.....	216	31	4		103	16	24	9
March.....	258	38	10	2	151	31	31	6
April.....	199	21	1		51	8	24	7
Totals.....	2,113	225	102	3	735	99	1,251	106

Total 4,201 cases and 433 deaths or a group case mortality of 10.31 per cent.

The figures here presented do not represent the normal incidence of tuberculosis, nor the death rate from the disease in males of this age group. Rigid examinations had removed all but a small residue of discoverable cases of tuberculosis from the troops before they embarked for the A. E. F. As rapidly as possible, with due consideration for the patient's welfare, all cases were returned to the United States as patients as soon as a positive diagnosis was established.

Deaths occurring among those invalidated home in whom the diagnosis was made first in the A. E. F. are not included in these figures.

It was thought that the damage to the upper respiratory tract, to the bronchi, and to the pulmonary parenchyma itself, resulting from exposure to various of the toxic gases used in battle, would predispose to

tuberculosis or tend to develop into an active stage quiescent foci, which might have existed prior to the gassing. No evidence of any predisposition to tuberculosis or unusual incidence of tuberculosis among convalescent gas cases has been discovered so far.

Taking the three groups of pulmonary tuberculosis, i.e., acute military, incipient, and chronic, it is to be seen that no notable change in incidence rates of this group as a whole occurred after the epidemic of influenza, as might well have been expected.

Monthly incidence rates of the group of tuberculous pulmonary affections in the A. E. F. per 100,000 strength were:

1917		1918		1919	
July....	64.3	January.....	111.8	January.....	25.1
August....	37.4	February.....	51.0	February.....	26.6
September..	53.6	*March.....		March.....	29.9
October.....	31.4	*April.....		April.....	22.8
November....	69.1	*May.....			
December.....	62.8	June.....	26.5		
		July.....	22.2		
		August.....	18.8		
		September....	21.4		
		October.....	18.9		
		November.....	15.5		
		December.....	21.3		

*Figures incomplete.

There are no figures available at the time of writing by which comparison with the experience of our Allies with tuberculosis may be made.

INFLUENZA AND PNEUMONIA

Although full consideration of the epidemiology, bacteriology, and pathology of acute epidemic respiratory diseases, including influenza, bronchitis, and pneumonia, will be presented by other authors, a brief statistical summary of the incidence and mortality of influenza and pneumonia will be included here to complete the general review of communicable diseases in the A. E. F.

Between July 1, 1917, and April 30, 1919, inclusive, there were reported in the A. E. F., 191,590 cases of influenza and 29,381 of pneumonia. There were during the same period 545 deaths from influenza and 12,849 deaths from pneumonia, or a case mortality of influenza of .28 per cent and of pneumonia of 43.7 per cent, and a combined case mortality of 6.06 per cent. The number of cases and deaths reported, and the incidence of these two diseases by months per 100,000 strength were as follows:

	Influenza			Pneumonia		
	Cases	Rate per 100,000 strength	Deaths	Cases	Rate per 100,000 strength	Deaths
1917:						
July.....	50	321	.....	18	116 0	7
August.....	117	438	.....	15	56 3	5
September.....	180	403	.....	28	62 5	.....
October.....	735	1,050	.....	98	110 0	23
November.....	2,120	1,980	.....	192	178 0	28
December.....	3,520	2,460	.....	508	358 0	80
1918:						
January.....	3,660	1,940	.....	980	520 0	158
February.....	2,195	958	.....	480	210 0	52
March.....	2,420	844	.....	625	218 0	90
April.....	1,850	428	.....	252	37 6	91
May.....	2,500	.....	.....	456	72 5	93
June.....	4,520	748	.....	660	89 3	89
July.....	5,097	516	4	620	62 7	95
August.....	8,099	751	10	971	90 1	308
September.....	37,935	2,500	56	3,560	235 0	2,114
October.....	38,655	2,200	269	7,008	402 0	4,823
November.....	22,066	1,086	85	2,621	111 0	1,467
December.....	18,201	952	28	2,629	138 0	921
1919:						
January.....	15,873	878	16	2,797	155 0	600
February.....	7,388	445	8	1,064	64 0	486
March.....	10,943	739	44	18,08	122 0	553
April.....	4,466	372	25	1,089	90 7	188
Totals.....	191,690	.....	545	29,381	.....	12,849

It would be entirely unprofitable to attempt to tabulate or report lobar and broncho-pneumonia separately under such conditions of the diseases as prevailed in the A. E. F. Rarely was it possible to make any type determination upon cases of pneumococcus infection, and the number of cases reported by types is so small as to present no interest in a general report such as this.

Of 104,225 cases of influenza and 9,576 cases of pneumonia reported in the British E. F. between September 28, 1918, and April 19, 1919, inclusive, 7,693 died, giving a combined case mortality of 6.75 per cent.

Of the 131,951 cases of influenza and 14,041 cases of pneumonia reported in the French Army in the Zone of the Army between September 20, 1918, and April 30, 1919, inclusive, there were 10,531 deaths, or a combined case mortality of 7.21 per cent.

The case incidence of influenza in the French Army in the Interior was from 2.7 to 11.7 times as high as in the Zone of the Army. The

case incidence of influenza per 100,000 strength in the French Army in the Zone of the Army and in the Interior for the months of July, August, September, and October, 1918, were as follows:

		<i>Zone of Army</i>	<i>Interior</i>
1918	July	118	1,281
	August.	126	1,476
	September.	971	3,964
	October	2,825	7,669

At no time did the incidence of influenza in the A. E. F. exceed 2,500 per 100,000 strength per month.

The monthly case incidence rates per 100,000 in the British E. F. and in the French Army in the Zone of the Army, for influenza and pneumonia are as follows:

	<i>Influenza</i>		<i>Pneumonia</i>	
	<i>British</i>	<i>French</i>	<i>British</i>	<i>French</i>
1918				
October	851 6	2,825 4	99 5	203 0
November	2,105 3	1,200 0	230 2	48 1
December	1,180 4	726 9	84 3	43 6
1919:				
January	509 6	361 1	29 3	21 4
February	891 5	705 7	68 3	93 7
March	768 5	356 7	59 1	30 2
April	302 4	118 2	15 1	12 7

It is particularly interesting to note that the highest incidence of influenza, as shown by weeks, fell in the A. E. F. in the week ending September 22, the highest reported from the French Army in the Zone of the Army fell in the ten day period October 10-20 and the highest incidence reported from the B. E. F. fell in the week ending November 2nd.

The ratio of pneumonia to influenza in the A. E. F. did not vary materially during the period of the epidemic. Pneumonia reported by weeks from June 15, 1918 to February 9, 1919, inclusive, were about 12 per cent of the number of cases of influenza reported during the same weeks, the exact percentages by weeks being as follows:

PERCENTAGE OF PNEUMONIA AS COMPARED WITH INFLUENZA

CASES BY WEEKS.					
1918	Per Cent		1918	Per Cent	
Week ending June	23	12.3	Week ending October	27	15.5
June	30	12.8	November	3	17.1
July	7	10.4	November	10	12.7
July	14	11.5	November	17	10.2
July	21	12.0	November	24	11.0
July	28	13.7	November	1	12.2
August	4	11.8	December	8	13.8
August	11	11.9	December	15	15.4
August	18	10.8	December	22	15.5
August	25	10.8	December	29	12.5
September	1	11.3	1919		
September	8	8.1	Week ending January	5	15.6
September	15	9.2	January	12	15.5
September	22	7.4	January	19	11.1
September	29	13.7	January	26	11.2
October	6	11.6	February	2	11.1
October	31	12.4	February	9	14.3
October	20	18.1			

In October, November, and December, 1917, and in January, 1918, the incidence of infectious respiratory diseases, so-called "clinical influenza, pneumonia, both lobar and broncho-pneumonia," reached very high rates, but, owing to the small number of American troops then in France, and because detailed study of communicable diseases in camps or hospitals had not yet been made, no comparison of rates was made, and the seriousness of the condition was not appreciated at the time. It may well be that the unusual conditions which the troops had to face, especially the crowded and ill-prepared living quarters, combined with very severe winter weather, were responsible for a more than usual seasonal expression of these diseases.

During February and March, 1918, the usual subsidence of influenza occurred, and in April the incidence was low. During the latter half of April, epidemics of a benign, acute, febrile infection appeared, first (April 15) at a camp near Bordeaux. In one week the affection, which resembled mild attacks of influenza, reached its height, and in two weeks more it disappeared from the camp without any secondary pneumonias or other complications, and having caused no deaths. Several camps and detached groups of white and negro troops in the vicinity of Bordeaux were similarly affected, from 2 to 10 per cent of the commands developing the disease suddenly on the same day.

The onset was sudden, with symptoms altogether like those of influenza. The patients were afebrile in two to three days and back

at work in four to five days. In about 10 per cent of the cases there was a mild bronchitis, but there were no other signs of symptoms of pulmonary involvement.

On May 1 the disease appeared in Tours, and by May 24 the episode at this post was at an end. The clinical picture was identical with that at Bordeaux.

On May 3, the disease, commonly called "three-day fever" appeared at Langres, at a Camp Hospital.

On May 22, a Base Hospital at St. Nazaire passed through a similar experience, and from this group of cases the influenza bacillus was found in nasal and bronchial discharges in a high percentage of the cases.

May 13-24, the disease appeared and ran its course at Chaumont.

May 20-24, it appeared at Bourbonne-les-Bains.

By June 1, the disease was widespread throughout the A. E. F., and evidence of civilian physicians was very definite to the effect that the disease had prevailed mildly in the civil population in France during March and April.

The disease showed sometimes one and sometimes another predominating symptom, but a typical clinical picture was as follows:

Abrupt onset with headache, usually occipital, severe, and at times with meningeal symptoms, severe backache and general muscular pains, fever, general soreness in the chest, especially sub-sternal, with a mild sore throat and a slight cough. No distinct chill occurred but the temperature often rose to 103° F., and sometimes to 104° or over. There was extreme prostration, and in some instances men fainted while on duty and had to be carried to bed. Recovery was rapid. Catharsis, symptomatic medication for pain, and rest in bed for two days was the only treatment found necessary and the average stay in the hospital was three days. There were no complications.

During July, the disease disappeared largely from among the troops in the A. E. F., and until the middle of September there was the usual seasonal freedom from respiratory infections.

In September, influenza in a much more severe form reappeared, and may be said to have raged in the A. E. F., reaching its height in the third week of September. It was at this time that the disease, which had meantime spread to England and the United States, appeared in its most serious form on the crowded transports arriving at the Base Ports in England and France.

The seriousness of the situation may be judged from the fact that in several convoys of transports, carrying a total of about 100,000 troops, there was a loss by death from pneumonia complicating influenza

on shipboard of 2 per cent of the strength within three weeks from the date of embarkation in the United States.

After the severe recrudescence of the disease in September, October, and November, the cases fell off until in December, 1918, the rate was much lower than for December, 1917. In January, 1919, there was a third wave of lesser severity and affecting a smaller proportion of the A. E. F.

During all the period from September, 1918, to February, 1919, the clinical manifestations of the disease have been extraordinarily severe, the complication of pneumonia developing in 5-10 per cent of the cases, and the deaths among the pneumonias running as high as fifty per cent. The cases were often overwhelmed by their infection and died within twenty-four hours of the onset. The lungs showed a picture of coalescing, patchy pneumonia, often with hemorrhagic tracheobronchitis.

For prevention and treatment, the nearest approach obtainable to out-door conditions has been found of the greatest reliance.

The use of gauze masks by patients and attendants has been widely adopted, and seems to have been of some service in protecting attendants against infection, and in diminishing the incidence of secondary or cross-infections among patients in wards.

Similarly, cubicles, or the use of screens between beds, have appeared to diminish complications and mixed infections. One notable fact is worth special mention, namely, that at the special base hospitals set aside at the Savenay Hospital Center, where all doors and windows of all hospitals buildings were kept open all the time, day and night, no cases of influenza, bronchitis, or pneumonia, occurred throughout the epidemic of influenza.

The etiological agent of influenza is not known.

Empyema as a complication was rare.

Infection and resistance are subjects concerning which there are more opinions than facts in dealing with influenza, but experience with large bodies of men of practically the same age group, under a variety of environmental, occupational, and climatic conditions, justifies the following general conclusions.

The infection is conveyed by direct discharge of nasal, mouth, and tracheo-bronchial secretions of patients from at least the earliest observable moment of appearance of symptoms until a week after the subsidence of fever in uncomplicated cases, or until the cessation of cough or other catarrhal symptoms in cases complicated by bronchitis or pneumonia.

The infection may be conveyed by the hand, and by utensils and

toilet articles when these vehicles have been soiled recently by moist respiratory discharges of an infected individual.

The chances of infection are increased with close and continuous personal contact, as in crowded barracks, mess halls, or meeting places.

The severity of infection appears to bear a close relation to so-called "lowered resistance," a condition apparently developed by fatigue, exposure to wet and cold, worry, strain, insufficient or irregular food and sleep.

Infection can be diminished in severity and extent in a command by providing not less than forty square feet per capita in living quarters, securing separation of sleeping bunks so that heads are separated by a partition, requiring boiling water for washing mess-kits, preventing promiscuous coughing, sneezing, and spitting in and about quarters, and particularly by segregating under hospital conditions all men found with the slightest symptoms of cold, malaise, or fever on medical inspection, carried out upon the entire command each morning and afternoon.

The treatment of influenza had been similar to that of other self-limited infectious diseases for which no specific medicament or bacterial product is known, namely rest, sleep, warmth, nourishing easily digestible hot food in suitable amounts, fresh air, preferably open air, and such symptomatic relief as can be obtained by a few drugs, avoiding coal tar depressants and alcohol.



HAY-FEVER AND ITS TREATMENT WITH POLLEN EXTRACTS*

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Pollinosis or "hay-fever" is undoubtedly caused by an individual hypersensitiveness to the pollens of various grasses, plants and trees. This fact is no longer questioned by the vast majority of observers. In the United States two types of hay-fever are recognized, dependent upon their seasonal periodicity, the spring type, usually due to the Gramineae or the large family of grasses, and the autumnal type usually due to the Compositae or a large mixed family of flowers and weeds pollinating in the fall.

This peculiar sensitivity to pollen in certain individuals has been satisfactorily explained on an anaphylactic or allergic basis. The commonly accepted hypothesis is that the pollen toxemia depends upon parenteral digestion of the specific protein of the pollen. This hypothesis places hay-fever in the same category as various other conditions that have recently been shown to be due to a hypersensitiveness to various specific proteins. Among these conditions may be mentioned horse sensitiveness; asthma, non-seasonal, often due to food or other protein; urticaria and certain other dermatologic conditions, often due to food proteins, and a few obscure conditions presenting only gastrointestinal symptoms.

It is upon the anaphylactic or allergic conception of hay-fever that the present specific method of treating this condition is based. This method is one of desensitization, which theoretically is an exhaustion or saturation of the protein splitting enzyme. It is accomplished by repeated small doses of the specific protein, with a gradual increase of dosage, until the organism is capable of withstanding the ordinary amount of pollen that is carried by the air. In order to be effective this desensitization must be pre-seasonal and should be completed about two weeks before the particular plant involved begins to pollinate.

The specific pollen protein to which a given individual may be sensitive is determined before treatment by a simple cutaneous test which has been described repeatedly. This skin test is clear-cut and easy to perform, consisting merely in placing a drop of concentrated pollen extract upon a slight abrasion of the skin, usually on the flexor surface of the forearm. The abrasion may be made with a needle or a von Pirquet borer but should not be deep enough to draw blood. A con-

*From The Division of Laboratories, Army Medical School.

trol abrasion is made on which is placed a drop of the pollen solvent, usually 16 per cent alcohol in physiological salt solution. The reactions develop in from ten minutes to one-half hours, a positive reaction consisting of an urticarial wheal with more or less hyperemia extending some distance around the wheal. As the reactions vary in degree and as most individuals have a multiple sensitization, the results are read comparatively and expressed by + signs. Usually desensitization is carried out with an extract of the pollen protein giving the strongest reaction but this may be varied in cases of autumnal hay-fever as will be explained later.

The pollen extracts used in diagnosis and treatment were obtained from a reliable commercial firm and apparently have proved satisfactory in every way.

In a former report, (1) on cases of autumnal hay-fever seen at the Army Medical School during the fall of 1919, a notation was made that more cases were expected to receive pre-seasonal treatment in 1920 and would be reported later. The following observations have been made upon a total of 67 actual cases of hay-fever which have been diagnosed at the Army Medical School since January, 1920.

CASES DIAGNOSED

Seventy-four different individuals have been tested with pollen extracts for the purpose of determining the particular pollens to which they were sensitive. These cases were divided as follows:

Spring hay-fever only.....	17 cases or 23 per cent
Fall hay-fever only.....	39 cases or 52 per cent
Both spring and fall hay-fever.....	11 cases or 14 per cent
Other conditions (negative reactions).....	7 cases or 9 per cent

From the above it is seen that among these 67 individuals with hay-fever there were 78 instances of sensitiveness to pollens, with 28 cases (36 per cent) of the spring type of hay-fever and 50 cases (64 per cent) of the autumnal type. Of these, 11 persons (14 per cent) had both types. Seven persons tested gave no reactions to the pollens used. Among these were various conditions in which it was desirable to eliminate the possibility of a pollen sensitiveness and none of the seven cases gave a clear history of hay-fever symptoms.

DIAGNOSIS OF SPRING HAY-FEVER

The outstanding feature of the 28 cases of spring hay-fever, or so called "rose cold" was the multiplicity of the pollens to which they were sensitive as indicated by the skin tests. Those cases sensitive to the pollen of the grasses were especially apt to give multiple reactions.

The following list gives the classification of these 28 patients arranged according to the major or strongest skin reaction given:

Timothy.....	12 or 43 per cent
June grass.....	6 or 21 per cent
Red-top.....	3 or 10 per cent
Orchard grass.....	2 or 7 per cent
Daisy.....	2 or 7 per cent
Rose.....	2 or 7 per cent
Clover.....	1 or 3 per cent

Most of the cases giving a strong reaction to timothy gave a slightly weaker reaction to June grass, orchard grass or red-top. There was no case in which a person gave a reaction to only one pollen. It is believed that, in the spring type of hay-fever, the multiple sensitization plays an important part, as all of the pollens for which tests were made, especially the grass pollens are of very light weight and easily air-borne.

In view of the fact that many authorities state that rose pollen is seldom, if ever, the cause of the so-called "rose cold," a special interest attaches to the two persons among the spring hay-fever cases who gave their strongest skin reactions to the pollen of roses. One case gave a definite history of being unable to go into a room containing roses without discomfort and could not endure being in their vicinity. The other case had very slight symptoms in the spring and had not been thrown in contact with roses to any extent. Both patients were only diagnosed and treatment was not attempted. The fact that two patients out of twenty-eight gave their major reaction to rose pollen might indicate that rose pollen is more frequently the cause of "rose-colds" than has been believed. However, the grasses are undoubtedly the greatest offenders and flowers probably play a secondary role.

DIAGNOSIS OF AUTUMNAL HAY-FEVER

Fifty cases of autumnal hay-fever have been tested against the various fall pollens during the past eighteen months. These cases have been divided, according to the strongest or major skin reaction, as follows:

Ragweed, short.....	25 cases or 50 per cent
Ragweed, giant.....	4 cases or 8 per cent
Goldenrod.....	8 cases or 16 per cent
Corn.....	6 cases or 12 per cent
Sunflower.....	4 cases or 8 per cent
Goldenglow.....	3 cases or 6 per cent

If, as has been customary, the size and severity of the cutaneous reaction is considered as indicative of the degree of sensitiveness of the individual, these results are somewhat surprising inasmuch as 13 cases gave a very strong reaction to pollens which are not commonly con-

sidered as causing hay-fever. Although these 13 patients gave their strongest reaction to corn, sunflower or goldenglow pollen, almost all of them gave weaker reactions to the ragweed or goldenrod pollen. It is probable that their symptoms were produced by the lighter, air-borne pollen of the ragweed or golden-rod rather than by the heavier pollen of the corn, sunflower or goldenglow, which can be only slightly, if at all, disseminated by the air. This fact does not invalidate the results of the skin reactions, for these individuals undoubtedly have a greater sensitiveness to the heavier pollens, which would be clearly manifested if they were to come in close contact with them.

At the commencement of the work and in the former report of the cases seen in 1919, previously referred to, this multiple sensitiveness was overlooked, the autumnal cases being tested only against short ragweed or goldenrod. Although the multiple sensitization in the autumnal cases is of scientific interest, some line must be drawn in testing these cases, as the list of pollens could be extended to include every plant that pollinates. The consensus of opinion is that all cases of true autumnal hay-fever are due to either the pollen of the ragweed or the goldenrod and some authorities would even exclude the goldenrod pollen, on the theory that it is the ragweed pollen settling on the goldenrod which makes this plant intolerable to certain hay-fever victims. It is not felt that this point has been definitely proven, however. If the cutaneous reaction is accepted as specific in indicating sensitization, evidence to the contrary would seem to be adduced by the fact that 3 of the 8 patients giving their major reaction to goldenrod pollen gave absolutely no reaction to either short or giant ragweed and they were certainly cases of autumnal hay-fever.

METHOD OF TREATMENT

The desensitizing injections are given by means of graduated dilutions of the pollen extract at five day intervals and only the extract of one pollen (usually the one giving the strongest cutaneous reaction) is used in desensitizing.

Only one pollen extract is used in the desensitizing process as there is supposed to be a group or family action in the pollen extracts. A large number of workers in this field, including Freeman, Goodale and others, have concluded that patients who are sensitive to more than one pollen of the same family may be immunized by using only one pollen of that family. Ordinarily the pollen giving the strongest skin reaction would be selected but in certain cases of autumnal hay-fever which give their strongest reaction to the heavy pollens and a weaker reaction to ragweed or goldenrod, one of the last named pollens have been selected for desensitization as being probably the cause of the symptoms.

The injections commence with 0.1 c.c. of a 1 to 10,000 dilution of the pollen and are gradually increased until the patient receives 0.4 c.c. of a 1 to 500 dilution. The desensitizing process is one requiring the greatest care and painstaking accuracy. It is not a simple procedure such as immunization with a bacterial vaccine, but, from the very nature of the malady, is closely bound to the subject of allergy and anaphylaxis. There is a very real danger, present at all times, of producing a very severe systemic reaction, allergic or anaphylactic in its character. This can be guarded against by following the one unalterable rule of making a skin test before each inoculation with the dilution that is to be used that day. If there is any appreciable reaction obtained, the next higher dilution must be used, making sure that the dilution used causes no reaction. Another safe rule to follow is never to give an injection to a patient who is feeling badly or below par in any way. Every patient should be retained under observation for a period of 15 minutes to one-half hour after the injection. Adrenalin should be available for immediate use at all times. If these rules are followed no untoward results are apt to follow the injections.

One case of a very severe allergic reaction following a desensitizing injection, encountered in our 1921 series of patients, will be described in detail in order to show the type and the severity of reaction that can follow the treatments.

Captain B, age 29, has suffered from hay-fever since boyhood. Symptoms have always been severe. Cutaneous tests gave the following results: Ragweed, short + + + +; ragweed, giant + + +; goldenrod + +; sunflower +—; corn and golden-glow negative. He was given the first dose of 0.1 c.c. of a 1 to 10,000 dilution. He had no local reaction at site of injection nor did he have any general or systemic reaction. Five days later he returned for the second injection. In view of the fact that he had had no local or systemic reaction to the first injection, the skin test was omitted and the second dose of 0.2 c.c. of a 1 to 10,000 dilution was given. He remained in the office for about ten minutes after the injection and then, being in a hurry, was allowed to depart. He first noticed a peculiar sensation of collapse while descending in the elevator which he described as a "completely gone sensation in the region of the stomach." Upon entering his automobile, which fortunately his wife was driving, he started for the fifteen minute drive to his home. In less than five minutes he was experiencing great difficulty in breathing and there was a complete loss of sensation in the lips and face, with marked swelling of lips and chin. His wife states that he was perfectly livid at this time and that he could not articulate owing to the edema and stiffness of his face. He was able to climb three flights of stairs to his apartment with the greatest difficulty owing to his asthmatic condition. He then collapsed upon the nearest bed and it was fifteen minutes before he could tell his wife to whom to telephone for assistance. A slight improvement was beginning to be noticed and he could articulate slightly. Patient was seen less than one hour after the injection. At this time he was in a state of collapse, asthmatic, extremely cyanotic, pulse thready and racing, intense edema of lips and face but the stiffness had left and he could talk with difficulty. There was an extremely severe

urticaria of both arms and trunk, not broken up into wheals but one continuous lesion, swollen, red and itching. He responded promptly to subcutaneous injections of adrenalin and in one hour was practically normal, except for headache and extreme exhaustion. A slight recurrence took place three hours later with asthma and slight cyanosis but this passed off in fifteen minutes without treatment. A moderately severe dull headache persisted for two days with noticeable weakness and exhaustion. No more treatments were given this patient owing to his highly hypersensitive condition.

The occurrence of this reaction probably would have been avoided had a skin test been made prior to the injection and had the patient been compelled to remain in the office for one-half hour after injection. This is the only case that has shown a severe general reaction following the desensitizing injection. A rigid observance of the rules stated above will undoubtedly prevent the occurrence or the recurrence of such an alarming and unfortunate reaction.

TREATMENT OF SPRING HAY-FEVER

A great many of the spring cases of hay-fever were only diagnosed and no treatment was given, inasmuch as the symptoms of spring hay-fever are not nearly as severe as the autumnal symptoms. Most of the patients were content to merely determine the pollens to which they were sensitive.

A few cases started to take the desensitizing treatments but left the city before the course of injections had been completed and before the grasses pollinated. In only two cases were we able to give the complete course of desensitizing treatments and observe the results.

One case, Capt. C, a medical officer, had had severe attacks of spring hay-fever for seven years. No autumnal symptoms. Dermal tests gave the following reactions: Timothy ++++; June grass +++; orchard grass ++; red-top ++; clover, daisy and rose negative. He received 12 injections of the timothy pollen extract in increasing strengths of dilution, starting at 0.1 c.c. of a 1 to 10,000 dilution and ending with 0.4 c.c. of a 1 to 500 dilution. The injections were completed before the first of June which was this patient's bad month. Result: Slight, if any, improvement over former years. Patient was on field duty during June and July and was exposed to grass pollens to an exceptional degree. This officer, who is a careful observer, states, "timothy did not seem to bother me particularly but orchard grass and alfalfa both greatly aggravated my symptoms." Although this patient was only desensitized against timothy pollen, if the view of group or family desensitization as given previously is correct, this case must be called a complete failure.

The other case, Mrs. S., wife of officer, had suffered for 20 years with severe hay-fever from the middle of May until frost with a slight inter-

mission in July and August. The autumnal symptoms were more severe than the spring. Dermal tests gave the following:

Spring pollens: June grass + + + +; orchard grass + +; timothy +; red top +; daisy +; clover and rose negative.

Fall pollens: Ragweed, short + + + +; goldenrod + + +; ragweed, giant + +; corn +; goldenglow and sunflower negative.

Patient received the full desensitizing course of treatment with June grass pollen extract and is now undergoing treatment with the autumnal pollen. Result: Almost completely free from symptoms this spring. Sneezed a few mornings upon arising. On one or two days eyes itched and were slightly congested. Almost no coryza or increased secretion. Patient states that she is more comfortable than she has ever been in the spring. The results of the desensitizing treatments for the autumnal pollen in her case will not be known until later this year.

Of the two cases of spring hay-fever receiving the full pre-seasonal desensitization injections, one received no benefit from the treatments and one case was markedly improved with apparently about 80 per cent benefit from the treatment. Naturally, no deductions can be drawn from two cases.

TREATMENT OF AUTUMNAL HAY-FEVER

Of the 50 cases of autumnal hay-fever diagnosed, 14 cases received desensitizing treatments in 1920 and 16 cases are being treated at the present time, prior to the 1921 season.

An analysis of the 14 cases receiving treatment in 1920 shows that 3 cases must be eliminated as they left the city during the treatments and did not receive the full course of injections. Of the remaining 11 cases, 9 persons received the full desensitizing course of ragweed pollen extracts and 2 cases received the full course of goldenrod pollen extracts. The results obtained in these cases are somewhat hard to classify as no two cases are exactly similar.

Of the two goldenrod cases, one had absolute freedom from hay-fever and a complete absence of symptoms of any kind. Treatment in this case was 100 per cent effective. The other case had slight symptoms, slight itching of nose, occasional sneezing and eyes slightly inflamed. These symptoms were not constant and there would be periods of a week or ten days that patient would have no trouble whatever. The symptoms were at no time severe and were in marked contrast to former years. Treatment was estimated at about 80 per cent effective in this case.

Of the nine ragweed cases receiving ragweed pollen desensitization, only one case showed complete freedom from symptoms. The results of treatment in these cases have been roughly classified as follows:

100 per cent effective	= 1 case or 11 per cent
80 per cent effective	= 2 cases or 22 per cent
50 per cent effective	= 4 cases or 44 per cent
No benefit derived	= 2 cases or 22 per cent

Combining the ragweed and goldenrod cases in order to obtain the percentages for all of the autumnal hay-fever cases, we get the following:

100 per cent effective	= 18 per cent
80 per cent effective	= 27 per cent
50 per cent effective	= 36 per cent
No benefit derived	= 18 per cent

These results are considered very encouraging in view of the fact that the treatment could be called a complete failure in only 18 per cent of the cases. 45 per cent of the cases were either completely cured or so markedly improved that their symptoms were not a handicap to them and almost passed unnoticed, while an additional 36 per cent of the cases were approximately 50 per cent benefited. I might state that, in this last class, the reduction of the severity of their symptoms by approximately one-half was considered a great boon by these patients.

The results obtained this year in the 16 patients undergoing treatment will not be known until October and will be the subject of another report.

SUMMARY

Of sixty-seven cases of hay-fever diagnosed by the cutaneous reactions to pollen proteins, 17 patients (25 per cent) had spring hay-fever only, 39 patients (58 per cent) had fall hay-fever only and 11 patients (16 per cent) had both spring and fall symptoms.

Spring hay-fever patients are especially apt to have a multiple sensitiveness to pollens, especially the grass pollens. Of the 28 persons with this type of hay-fever, 43 per cent were most sensitive to timothy pollen and 21 per cent to June grass pollen. The other cases were divided between red-top, orchard grass, daisy, rose and clover. Practically all of the patients giving a strong reaction to one grass pollen gave weaker reactions to various other members of the grass family.

Fifty cases of autumnal hay-fever were diagnosed. 50 per cent of these patients gave their strongest reaction to short ragweed, 16 per cent to goldenrod, 12 per cent to corn, 8 per cent to giant ragweed, 8 per cent to sunflower and 6 per cent to goldenglow.

Only two individuals with spring hay-fever received full pre-seasonal desensitizing injections of pollen extracts. Of the results obtained in these two patients one was a complete failure and one was very successful, 80 per cent of relief from symptoms being estimated.

Eleven patients with autumnal hay-fever received pre-seasonal desensitizing injections, two patients receiving goldenrod pollen extract

and nine patients receiving ragweed pollen extract. In one of the goldenrod cases treatment was 100 per cent effective, the patient having no symptoms and in the other, the patient had very slight symptoms, treatment being estimated as 80 per cent effective. Of the nine patients treated with ragweed pollen extracts, one (11 per cent) had complete relief, two patients (22 per cent) were estimated at 80 per cent relieved and four patients (44 per cent) were estimated at 50 per cent relieved. Two patients (22 per cent) obtained no relief whatever and the treatment was called a complete failure in these two cases.

The percentage of effectiveness in all of the autumnal hay-fever patients, ragweed and goldenrod combined, were as follows: complete relief—18 per cent; 80 per cent of relief obtained—27 per cent; 50 per cent of relief obtained—36 per cent and no relief whatever—18 per cent.

The treatment of hay-fever by desensitizing injections of pollen extracts is a method requiring great care and accuracy. There is always a possibility, in especially hypersensitive people, of setting up an allergic reaction of great severity but this can usually be avoided by following certain definite precautionary rules in giving treatments.

CONCLUSIONS

The cutaneous test for hypersensitiveness to pollens is a simple, safe procedure and is invaluable in determining the particular pollens to which an individual may be sensitive.

The treatment of hay-fever by desensitizing injections of extracts of specific pollens requires accuracy and caution, and, although not always successful, it apparently offers the most rational and effective means of treating this condition.

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THROMBOSIS OF CAVERNOUS SINUS OF OTITIC ORIGIN

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THROMBOSIS of the Cavernous Sinus is a rather rare condition. A careful study of the literature by Dorland Smith in 1918, showed 140 reported cases, of which 56 (40 per cent) were secondary to ear conditions, 49 (35 per cent) were secondary to face or orbit infection, 18 (13 per cent) were secondary to mouth or throat infection, 13 (9 per cent) secondary to nose infection. Recoveries on all types of cases were 7 per cent.

Anatomy. The cavernous sinus receives veins from pterygoid and pharyngeal plexuses of veins; from the frontal lobe of the brain and middle cerebral veins, and from the orbit. Posteriorly it divided into the sup-petrosal sinus which passes across the sup. surface of the temporal bone to join the lateral sinus, and the inferior petrosal which follows along the posterior inferior border of the temporal bone to the jugular foramen where it joins the internal jugular vein. One, two, or three, communicating sinuses exist connecting it to the cavernous sinus of the opposite side. Corresponding to this anatomical situation, it has three main sources of infection: The ear, through the petrosals; the mouth and throat, through the pterygoid veins; the orbit, nose and face, through the ophthalmic veins. Further, because of the communication to the cavernous sinus of the opposite side, involvement of the one is frequently followed by involvement of the other. (One-half the reported cases.) The sup. ophthalmic vein communicates with the angular vein and receives blood from the ethmoidal veins, it then joins the inferior ophthalmic and enters the cavernous sinus along with the central vein of the retina. This separate course of the central vein of the retina probably accounts for the late involvement and often slight disturbance of retinal tissues in such cases as recover.

Diagnosis of the condition presents no special difficulty. The combination of a definite source of infection in the zone described, with the progressive swelling of the orbit, producing first ptosis, then limited movements of eyeball, then fixation and proptosis, and, finally, marked chemosis, dilated pupil and impairment of vision associated with the general symptoms of systemic infection and meningeal irritation. Other conditions that might be mentioned for differentiation are operative and traumatic conditions, arterio-venous aneurysm, malignant or congenital new growths, orbital cellulitis, dacryo-adenitis, and orbital

periostitis. The only condition likely to cause real difficulty is orbital cellulitis. Here the condition may absolutely simulate the eye appearances of thrombosed cavernous sinus, but there will be an absence of or minor signs of systemic infection and of cerebral irritation. A case in point occurred at Holf General Hospital this spring. A boil inside the nose was followed by a cellulitis which spread over the cheek on that side, then up to the eye and into the orbit. Following this, the typical picture of exophthalmos, diminished mobility, then fixation and chemosis of the eye. There were absolutely no cerebral symptoms, no severe chills, or high temperature, thus indicating that the eye condition was due to cellulitis and venous stasis instead of thrombosis. The swelling remained at its height about two days, then gradually subsided. Motion of the eyeball returned gradually until it became normal. Vision was not disturbed at any time. It is an interesting fact that eye ground changes are very late to appear in thrombosis of the cavernous sinus and are often very insignificant. A blurring of vision frequently develops, and some constriction of retinal vessels and disc, but not at all the picture of choked disc. In a number of cases where the eye ground examination was made, findings were reported negative. Involvement of the eye, though occurring late, is a serious factor, as of Jackson's four cases reported only one had good vision after recovery, and all cases reported by Johnson and by Davis lost their vision. In the four cases of otitic origin that have been reported as recovered in the literature the lateral sinus was opened and drained, and there was a stormy period of convalescence, during which metastatic inflammation in the chest or joints occurred. In Adair-Dighton's case he washed the lateral sinus and the jugular bulb through from the opened end in the Mastoid wound to the open jugular vein in the neck and suggested that possibly the washing process aspirated the clot from the cavernous sinus. When one examines the course of the petrosals, their size, and the relation of the cavernous sinus anatomically, this explanation seems very doubtful. In Bouigois's case the infecting organism was evidently of very low virulence, as the patient had had air discharge since childhood, and had been having severe head pains for three months before he was seen, and even when the cavernous sinus thrombosis developed there were no chills, no jaundice, and a very moderate temperature reaction to 101.4. The case was under treatment from August 9, to November 11, and for two months received intravenous injections of collaigol. Whether this was a factor in the recovery is hard to say. Metastatic abscesses occurred in this case in the pleura and extension abscess in the neck. In Johnson's case of recovery, the lateral sinus was found filled with clot clear back

to the torcular—free bleeding was obtained and the sinus packed—a knee joint metastasis developed, but the patient left the hospital in eleven weeks. Vision of the affected eye was permanently lost.

Several methods of direct approach to the cavernous sinus have been suggested. Mosher suggests exenteration of the orbit by the Kroenlein procedure, then resection of a part of the external orbital wall (greater wing of sphenoid), elevation of dura, and direct incision into the cavernous sinus. This was tried in one case unsuccessfully, but Mosher subsequently performed the operation on ten cadavers and recommends it. It seems as if this method of approach were anatomically exact and practicable, but is a very mutilating operation, and the risk of accidental damage to other structures is very great. Bircher burrowed through the apex of the petrous portion of the temporal bone near its posterior superior border and opened the sinus from behind where it divides into superior and inferior petrosals. From a study of the skull it would seem to be very difficult and very uncertain to arrive at the proper point unless there was a pus fistula which would show the operator the direction to pursue in his removal of bone.

Suggestion has also been made to approach the cavernous sinus after the fashion of the gasserian ganglion removal. This approach is rapid and easy at the start, but in attempting to work at the necessary depth after lifting the brain, the operator is at a decided disadvantage and would be very apt to damage other structures or open the carotid artery instead of the sinus. Drainage, moreover, would be very difficult, if not impossible, anatomically, and there would be markedly increased danger of meningitis. Luc proposed to approach the sinus by way of the antrum, but here the operator would be at great disadvantage in working through the spheno-maxillary-fissure and sphenoidal fissure, with no guides to help him avoid important structures. The sphenoidal route seems also to be possible, and is advocated by Langworthy. In a case where the sphenoid was reasonably accessible and favorably shaped this route should be possible. On the other hand there would certainly be cases where it would be impracticable. In passing through the external wall of the sphenoid the operator should be careful to keep low down on the side and enter the sinus from below, thereby running less chance of injuring the carotid artery.

The case of cavernous sinus Thrombosis herein presented is of particular interest in that it was under observation throughout its entire course and the autopsy definitely showed how the case had developed.

A. L. C., age 22, was admitted to Hospital on July 10, 1920, with an acute running right ear of two days' duration. The drum had ap-

parently ruptured on July 8, and free drainage was coming from the meatus. Routine cleansing treatment initiated and the case watched closely for developments. Some tenderness was found over mastoid, but this was not marked and symptoms in general were moderate.

On July 12, an X-ray of mastoid showed: A dense sclerotic area around auditory meatus. The cell outline around this area is cloudy and ill defined, but the cells at the tip of the mastoid and the posterior portion of the mastoid are clear. Left mastoid cells are clear.

On July 15 chill occurred at 10 a. m.; temp. 103. A further chill occurred at 12 noon. Blood count 12,400, 86 per cent Poly., and at time of operation, 1.30 p. m., temp. was 105.5. A simple mastoid was performed, pus found in the attic, and also in the mastoid tip. The sinus plate was intact and healthy. There was a small exposure of dura which appeared healthy. Convalescence from this operation was uneventful. Temp. within a degree of normal for a week, and patient was up and about in wheel chair.

On night of July 22 he was very uncomfortable, and noon the 23d a chill with temperature of 103; a further chill at 5.30, temperature 104. A blood count and blood culture were taken at once, which showed W. C. 20,800; hemoglobin 75 per cent; small mono., 5 per cent; large mono. 7 per cent, with neutrophiles 88 per cent. The blood culture was sterile after 48 hours' growth. Of course the culture report could not be rendered at once. There was no bone tenderness over the palpation of neck. Temperature and general condition ameliorated that evening, but a suggestion of swelling of the right upper lid was observed. Next morning, July 24, the swelling of the lid was definite and progressing steadily. X-ray examination of sinuses showed large frontal sinuses and several large supraorbital ethmoids. The left frontal sinuses are clear. The right, which are divided into two sections, are slightly cloudy in the outer half, but the outline is very distinct and it has not a typical pus appearance. There is an area of orbital density which persists in its location in two pictures taken at markedly varying angles. Nasal examination showed normal membranes with no inflammation. Spinal puncture performed that morning showed: Pressure, normal. Globulin, trace. Cell count, 575, with 97 per cent polynuclears and 3 per cent small mononuclears. A culture was reported sterile after 48 hours' growth.

The diagnosis of thrombosis of cavernous sinus, with decision to operate, at once was made. The lateral sinus to be opened and search made for evidence of brain abscess or meningitis. Operation at 3 p.m. Granulations curetted out of mastoid cavity, attic opening enlarged as

far as possible, and plate underlying dura, from tegmen tympani to posterior angle, removed. The dura appeared healthy, but it was felt that a decompression would thereby be accomplished and the sagging dura would act as sac collecting pus if there were a localized meningitis. This was thought advisable on account of the high cell count in the spinal fluid and the laboratory statement that this probably indicated a true meningitis. (The culture from the spinal fluid proved to be negative, but this information was not available until the following day.)

The sinus plate appeared entirely normal, but it was removed and the sinus exposed from knee to bulb. The sinus felt very soft on palpation, but was shown to contain fluid blood and appeared normal. Both ends of the exposed sinus were packed and the sinus freely opened for a distance of one inch. The lower pack was then removed and bleeding followed from the bulb. This was packed off and upper pack loosened. Free bleeding secured, and then iodoform gauze packing introduced directly into the sinus opening, and pack in place till hemorrhage stopped. Light packs were put in attic and against exposed dura, and patient returned to ward.

Patient did well that night and the following morning, but the eye swelling, which apparently stopped following the operation for 12 hours, started up again and increased rapidly and progressively. By Monday noon, July 26, 24 hours after operation, this swelling had reached a point that the eyeball was absolutely fixed, pupil dilated, vision hazy. Fundus examination showed congestion of retinal veins and blurring of disc. A marked chemosis of the right upper and lower lids was present. Temperature, 102, and very severe head pain. In view of the imminent danger of complete loss of vision from the extreme degree of pressure, an incision was made through the tarsoorbital fascia at upper inner quadrant of orbit under novocaine anaesthesia, and blunt dissector pushed well back into the orbit. No pus was obtained, but the engorged tissues bled freely and a rubber tube with gauze drain was introduced deep into the orbit. The temperature receded following this incision and drainage, and remained under 100.6. On the following evening, July 27, slight swelling appeared in lower lid left eye. This progressed slightly and very slowly during July 28, but the patient's general condition improved, and on July 29, this swelling had practically disappeared, and the right eye was markedly better.

Drain removed from orbit July 30. There was further improvement and marked subsidence of swelling of right eye. Each day a small length of the iodoform pack in mastoid was removed, the final layers not being removed until August.

On July 31, he awoke early in the morning with a severe pain in the back and headache, and had slight temperature during the afternoon. August 1, at time final layers of packing were removed, the wound area was carefully inspected and irrigated with peroxide; condition of the wound seemed very good, and no sinuses, or signs of retained pus, though the headache was continuing, and temperature became higher that afternoon. August 2 there was a continuance of symptoms. Dakins tube was put in the mastoid wound, and intermittent irrigation every two hours instituted. He refused a spinal puncture at this time, but agreed to it the following morning. August 3, laboratory report received that afternoon shows cells 500; globulin, trace, and smear showed gram-positive cocci arranged in chains. Culture reported next morning showed streptococcus hemolyticus. Following the finding of tegmen tympani and also through the obliterated part of the lateral sinus, and drainage of the meninges secured. Another spinal puncture that evening brought about 5 c.c. of practically pure culture streptococcus and an intravenous injection of 100 c.c. of anti-streptococcus serum given at once to obtain transfusion into the meninges of the auto-anti-serum. (A preliminary injection of $\frac{1}{2}$ c.c. intradermically preceded the large injection, to guard against anaphylaxis.) Was somewhat delirious that night and very apathetic next morning, but temperature was lower. August 4, a similar injection was given in the morning and again in the afternoon. At 9 p.m. he had a bad sinking spell, pulse became very weak and rapid, and respiration went up to 60. Under stimulations this was overcome and he rallied slightly; but became weaker during the night, and died at about 3 a.m.

AUTOPSY REPORT

Autopsy: August 5, 1920, 11 a.m. Limited to dissection of head.

Prosector: Chas. G. Sinclair, Maj., M. C.

Inspection: Man of age 21, height 66 in. weight 130 lbs. Nourishment moderate, musculature moderate. Old mastoid scar behind left ear. Recent mastoid surgical wound, right. Right eyelid slightly swollen. Head is brachycephalic.

Examination of Head

Brain: Slightly enlarged. Ventricles contain considerable increase of fluid which is slightly turbid. At base of brain a yellowish pus follows along the course of the meningeal veins.

Sinuses: Right lateral sinus has been opened in radical mastoid operation, and is thrombosed about 2 cm. on either side of surgical injury.

Right cavernous sinus contains an old thrombus.

Dura Mater: Surgical incision through dura into middle fossa and posterior fossa of base, from the mastoid wound (made at secondary operation).

Bone: Radical mastoid has been recently done on right side. At inner end of petrous portion of temporal bone suppuration has taken place, with considerable erosion and fragmentation of the bone; this is marked in vicinity of cavernous sinus, and about 1 c.c. of thick yellowish pus is here found. The process extends through petrous bone in a lesser degree, and along the line of the carotid canal to the operation depression in mastoid. Posterior clinoid process, right, has sloughed off. Sphenoid sinuses contain small amount of clear fluid, walls are negative.

Bacteriological Findings

Cerebrospinal Fluid: Streptococcus Haemolyticus (pure culture).

Cavernous Sinus-right: 1 Strep. Haemolyticus-dominant. 2 Staph. Albus.

Sphenoid Sinus: 1/Strep. Haemolyticus-dominant: 2 Staph. Albus.

Autopsy Findings: 1 Meningitis, acute, streptococcic. 2/Thrombosis of cavernous Sinus-right. 3 Abscess, right, inner petrous bone. 4/Recent radical mastoidectomy.

Cause of Death: Meningitis, acute, streptococcic.

CHAS. G. SINCLAIR, Maj. M.C.

It is interesting to note the marked remission of symptoms which occurred July 26 to 31. It would seem as if the opening and draining of the lateral sinus were successful in stopping the progress of the septic thrombosis until further erosion by the very virulent pus let the pus into the meninges. In three of the four cases reported in literature to have recovered, this same operation was done, which suggests that provided the virulence of the infection is not too great, prompt drainage of the lateral sinus gives a fair hope of recovery.

Following the operation of incision and drainage of the orbit on July 26 there was a rapid subsidence of the exophthalmos and return of the mobility of the eye and of vision. This shows that by draining promptly the congestion and oedema of the orbit and thereby relieving the back pressure, collateral circulation is quickly established and that loss of vision in these cases can be prevented. In this case complete collateral

circulation had been established by August 1. Further, the complete return of muscle movement of the eye in all directions shows that in this case at least, and presumably in others, the immobility of the eye is not due, as has been supposed, to paralysis of the nerve to the eye muscles, but is entirely a pressure phenomenon, and remediable by a simple operation which can be done at the bedside under local anesthesia.

From a study of the anatomy of this particular case on the autopsy table it seemed as if the direct approach to the cavernous sinus by the sphenoidal route would have been more feasible than any other.

Anti-streptococcus serum was given intravenously in large doses, and the meningeal fluid drained so as to obtain the maximum osmotic effect, but it seemed to exert little effect on the progress of this case.

The autopsy showed that the pus must have burrowed through the temporal bone, following along the course of the carotid artery, then eroded its way through the apex of the temporal bone where an irregular area of necrosed bone about ten millimeters by five millimeters was found. At this point the infection had evidently entered the cavernous sinus directly. This accounts for the failure to find a clot in the lateral sinus when this was opened and drained in both directions. The existence of this fistulous tract was not evident at the time of the mastoid operation, so it would not have been possible to have followed this tract in bone removal as in Bircher's case. Further erosion evidently occurred during the period of remission of symptoms, July 26 to August 1, and then culminated in the meningitis when the dura barrier gave way. The course of the infection in this case was very definitely shown to have been through the substance of the bone instead of by a venous transmission, as occurred in most of the other reported cases.

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REPORT OF EPIDIDYMYTOMY ON THIRTY-TWO CASES OF GONORRHEAL EPIDIDYMITIS

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The clinical history of gonorrheal epididymitis is so familiar to every surgeon doing genito-urinary work that it is scarcely necessary to describe this condition. The patients suffering from either acute or chronic gonorrhea first notice pain in the groin, which usually progresses, and extends down into the testicle. The testicle enlarges and the skin of the scrotum becomes red and leathery in appearance. The patient may or may not have a chill, but the temperature ranges from 99 to 104. The pain is very intense, frequently causing the patient to roll from side to side in agony. The classical method of treatment is, shave the parts, strap up testicle, apply hot applications, with or without some drug. The course of this condition is very uncertain, total disability lasting from one to two months, and even then a large number of relapses occur. The infection travels down to the vas deferens, from the posterior urethra to the globus minor which is located at the back and lower part of the testicle, thence it spreads up through the body of the epididymus to the globus major. These structures become hard and brawny, and feel like calcified bodies lying at the back portion of the testicle. Frequently there is associated with this condition an acute hydrocele, and this enlargement gives rise to the popular name "swollen testicle." There is an extravasation of blood and the formation of pus in the interior of the globus minor, major and body of the epididymus with great distension of these structures so that they surround the testicle just as the birds nest surrounds the egg. Very rarely is the testicle at all swollen, but it can be palpated, approximately normal in size, lying slightly within and in front of the swollen epididymus.

The classical treatment prescribed above is very unsatisfactory:

1. Because of the long time the patient is incapacitated. 2. Because of the large number of recurrences. 3. Because it violates one of the principles of modern surgery, which is. "When there is pus evacuate it." In a large proportion of the cases, under the classical method of rest, some portion of the epididymus is permanently stenosed and the man is rendered sterile as far as that particular testicle is concerned. Hence the question of sterility in surgical interference need give us no particular concern.

Since our introduction of surgical interference in the treatment of gonorrheal epididymitis the operation has become popular among the

victims of this disease, and were the surgical treatment not given, the patient's themselves would demand it for the relief it affords from pain if for no other reason. The pain in the cases reported in this series varied from that sufficient to keep a man off his feet to agony which caused the patient to roll from one side of bed to other. Each of the patients operated on had temperatures ranging from 100 to 104. Of these, three were bilateral, sixteen right, and thirteen left. No accurate record has been kept of those suffering with an acute hydrocele, although a large proportion had this condition. The quantity of discharge from the penis varied from that of frank anterior urethritis to an entire absence, with only the history of a previous attack of gonorrhea. In the latter the gonorrheal nature of the process was confirmed by subsequent prostatic smear. The common feature of all was the hard nodular swollen condition of the body of the epididymus, globus minor and major. On the genito-urinary service at this hospital to make a diagnosis of gonorrheal epididymitis is to operate. This stand has been taken because experience has shown that men with gonorrheal epididymitis, even though they may not have a severe condition when admitted, would if given the classical rest treatment develop excruciating pain, and high temperature, accompanied by increased destruction of normal tissues as the result of the high tension. Even those cases which subside temporarily, if sent to duty two weeks after the subsidence, frequently return with a recurrence.

The operation is as follows: The patient having been anaesthetized, a small incision is made in the scrotal wall posteriorly just above the globus minor. Grasping the testicle in the left hand to render it immovable, the globus major, minor and the body of the epididymus are opened by puncturing them with a pair of sharp pointed hemostats held in the right hand. The hemostats are pushed in, one half to one c.m. and the jaws opened. This allows the escape of the exudate and pus, relieves tension, and secures drainage. This procedure is continued until all nodular masses are broken up. This latter is important as each nodule or mass of nodules is a focus of infection which will continue to give trouble unless evacuated and drained. The point to be remembered is that the body of the epididymus, globus minor and major are no longer patent tubules but a series of small abscesses and blind pouches harboring necrotic, and semi-necrotic material, which must be thoroughly removed. If there should be an acute hydrocele the fluid escapes through the incision. Unless a small artery has been cut in making the incision no ligation is necessary. The blood and fluid escaping through this incision in several cases contained macroscopical pus. Upon withdrawal of the hemostat the wound is covered with

gauze and the testicles placed on an adhesive plaster sling stretched between the thighs and the patient then put back to bed. Upon awakening from the anaesthetic the patients usually comment on the complete and absolute relief from pain. Only in three cases was any discomfort felt, and in these three cases the pain complained of was in the vas deferens where it passed through the inguinal canal, the pain in the testicle had ceased.

The temperature in all cases became normal in twenty four hours, the patient's appetite returned, and usually the day after the operation the majority of patients asked permission to leave the bed. This was always granted. Every patient was given a suspensory and told that he could get up as soon as he felt able. Drainage from the wound usually lasted from twelve to forty eight hours, after which the wound closed rapidly. Our most spectacular case was one in which the patient returned to duty at the end of four days, feeling fine and free from discomfort. The average duration of the disability was nine days, the longest being two weeks.

The epididymus in these cases did not return at once to its normal size, and although slightly swollen and tender upon firm pressure it was not in any sense painful. In no instance has there been a recurrence of the epididymitis, pain or swelling in the testicle, or in that region. In all, except one case, upon the relief of the acute hydrocele there was no return of this complication. This latter was a bilateral epididymitis with an enormous acute hydrocele, also bilateral. The hydrocele occurred in the left side to a moderate extent on the second day but disappeared on the fourth, after which the patient made an uneventful recovery. Whether the patients remained in bed three or four days or got up the day after the operation, apparently had no effect upon the local condition except that those who did get up were in a more cheerful frame of mind.

The ultimate results of epididymotomy are excellent in our series. All of the thirty-two patients have returned to full duty. There have been no after pains, contractures, or painful scars which so frequently follow varicocele and hydrocele operations. The patients themselves are thoroughly satisfied with the results. The more extensive operations involving complete exposure of the testicle and epididymus upon men suffering from gonorrheal epididymitis are hardly justified in our opinion. The larger incision, the increased manipulations only open up new avenues to infection and the results could not be any better than those above described.

Orchitis is such a rare complication that its presence at once makes one suspicious that the condition is not due to gonorrhea but to some

other cause. The most common cause of epididymitis is gonorrhea and it should be so considered until proved otherwise.

In conclusion early epididymotomy is advocated for the following reasons: First, it shortens time of disability. Second, it gives complete relief from pain. Third, there is an immediate relief from toxemia. Fourth, there occurs a minimum destruction of healthy tissues and a limitation of the disease process. Fifth, there is a total absence of recurrence. Sixth, the procedure is simple and quick, usually taking about five minutes after the patient is anaesthetized.



INJURIES OF THE HEAD AND EYES IN WARFARE¹

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THE lessons learned from the unprecedented use of heavy armament, of high explosive charges of terrific detonating powder, of enormous numbers of machine guns and of predominant trench warfare during the European conflict of 1914-1918, are certain to influence if not to dominate the methods of warfare and military surgery for some time to come.

As a direct consequence of the introduction of these modern factors, the nature and relative frequency of military wounds have been materially altered. The problems of trench fighting have become those of siege rather than of mobile warfare and the necessity for blasting men out of reinforced earthen entrenchments by high explosive shells has led to the natural result that wounds from artillery projectiles have become more than twice as frequent as bullet wounds; whereas in the various types of mobile warfare, artillery wounds seldom exceed from 10 to 25 per cent of all wounds.

The use of arms having greater range and of projectiles having greater penetration led to an increase in the gravity and frequency of head and ocular injuries. In the Chino-Japanese war of 1894 the eye injuries formed 1.2 per cent of all wounds, an increase which was maintained in the Spanish-American, Boer, and the Russo-Japanese wars. Of the 2,000 soldiers which had been examined up to April 20, 1916, we will only retain 698. This number corresponds with the total of wounded presenting traumatic lesions of the visual system, caused by a projectile or a war weapon. (Morax and Moreau.) The frequency of ocular wounds by shell fragments is clearly shown by this statistic, in opposition to the extreme rarity of ocular wounds by the bayonet. After having examined the general mode of action of projectiles upon the visual system, it is necessary to indicate for each the characteristics of its particular action.

SHELL AND TRENCH ENGINE FRAGMENTS

We have established a somewhat arbitrary division in classifying the vulnerating fragments in three categories—small, middle and large. This classification is necessary when the relative protection against wounds produced by these fragments has to be examined. We will call a large fragment one in which the weight can be compared or is superior to that of a bullet. A German bullet weighs 10 grams; the shrapnel

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ball weighs 8 to 9 grams. We only indicate the medium ones. All fragments superior to 5 grams are arranged in this group. It is seldom that missiles of this weight reach the orbit only; they get beyond its two sides, injure the eye, go through the bony partitions which are as thin as those constituting the superior maxillary.

When the fragment has not been retained by a more resisting bony partition and, consequently, is no more there to be weighed and exactly recognized, its volume may be inferred by the injuries it brought on. This is the way in which we acted to establish our statistic. The weight of a small fragment does not exceed 0 gr. 25 to 0 gr. 30, but it may be inferior to 0 gr. 001. Whatever may be the projection power of this small fragment, it exceptionally penetrates deeply into the orbit. It, however, may go through the eyelid and the sclera, penetrating the eyeball, but once in the globe the propulsion force is lost so that it cannot pass through the opposite wall into the orbit. The intraocular projectiles belong to this category. The medium fragments weigh between 0 gr. 30 and 5 grams. These fragments generally cause double perforation of the globe. They may go through the teguments and then get caught in the orbit. They are generally retained by its bony walls. Fragments of 2 or 3 grams may no doubt go through the tissues contained in the orbit and then go through the internal orbital wall. When the ocular tissues are not injured directly, but the peri-ocular tissues (eyelids, orbital tissue, etc.) are affected thereby, they frequently lead to chorio-retinal contusions.

After the foregoing, if we take over the 341 cases of wounds by shell fragments, it will be seen that they are divided in the following manner as regards the dimension of vulnerating shell fragments:

Large fragments	75
Medium fragments.....	96
Small fragments or dust.....	170

By summing up the different cases of wounds by shrapnel fragments, grenades, etc., we obtain the following figures:

Total wounds	486
Wounds by small fragments	265 = 54 per cent

Out of 697 wounded, 160 only have kept or recovered a useful vision of the wounded eye. As we have already indicated several times, in reckoning the considerable capital represented by the visual system, one can readily see of what importance are ocular wounds, taking simply into account the economic consequences brought on by them. It is remarkable that the eyes, whose combined surface is only about 1/375 of the surface of the body, should be involved in approximately 8 per cent of all injuries, but the explanation lies in the constant exposure of the head

and especially the eyes, in trench warfare; in fact, that the eyes are so frequently injured by fine particles which would have no deleterious effect elsewhere in the body, and in the great frequency of symptomatic involvement as a consequence of remote lesions.

The present war, among other advances, has led to a better knowledge of *cerebral localization* and particularly of cortical visual representation; to the recognition of concussion syndromes of the brain and of the optic apparatus due to high explosives; to a clarification of the causes and treatment of traumatic ocular neuroses or psychoses and, possibly above all, in the bacteriology and treatment of infections, the lessening of which has become the greatest problem in military surgery. It is well known that the outcome of industrial injuries of the eyes often depends upon how and when the first attention is given, for failure to close or to cover the perforating wound of the eye may be as responsible for the ensuing infection as the injuring foreign body. In this connection it frequently happens that the missile which has damaged the eye produces other lesions of gravity in its direct or deflected course, tears off the lower face, opens the anterior cranial fossa, traverses the larynx, fractures the cervical spine or enters the thorax, and it is the rule in these cases that the grosser clinical damage dominates the scene and that the ocular injury receives little or no attention from the general surgeon, but is seen by the ophthalmologist weeks or months after the injury, when its condition has become irremediable, or an active source of danger to the other eye.

LAWS RULING THE DISORDERS OF THE EYE IN THE INJURIES OF THE ORBIT,
THE EYEBALL BEING PRESERVED—(LAGRANGE)

1st Law: The commotion of the air by the explosion of a shell at a distance may injure the eye so severely that the inner membranes are lacerated. There exist well proven cases of luxation and sub-luxation of the lens, of traumatic cataract by this mechanism. Lesions of the inner membranes alone are analyzed in our first group of cases, because they are as yet not very well known and are even subject to controversy. They consist of lacerations of the uveal tract at the posterior pole.

2d Law: When the missile passes above the orbit, injuring the frontal bone and anterior cerebral region, it produces fractures of the orbital vault, which at the level of the foramen opticum and of the sphenoidal fissure, cause disorders in the sensory, motor and sensitive nerves of the orbit. The eyeball is uninjured.

3d Law: When the missile travels through the face, below the eyeball, without going through the orbit and without fracturing it, it produces lesions by concussion involving the eye at the level of the

macular region. *It is the most common cause of impairment or loss of central visual acuity.*

4th Law: When the missile fractures the orbit, depressing more or less its walls and without injuring the bulb, it produces in the eyeball severe lesions by commotion, macular and paramacular lesions. These latter exist, distinctly, whatever the location of the lesion may be, on the external, internal or inferior walls. Besides, there exist peripheral lesions, always seated in front of the orbital wall which has been injured by the missile. Probably the orbital wall is at the same time fractured, raised and thrust on the eyeball and in this case we have to deal with a lesion by contact. But, whether the contact exists or not, we observe a remarkable fact. The peripheral lesion of the inner membranes is always situated in front of the fracture.

5th Law: When the missile passes through the orbit without injury to the eyeball, it produces the same disorders, but with the addition of lesions resulting from the laceration of the organs contained in the orbital cavity. Very often the optic nerve is cut through; then, the disc is lacerated as if it had been pulled out.

6th Law: When the missile grazes tangentially the eyeball without rupturing it; or, when the bulb is violently contused by the orbital wall thrust in, there arise immediate disorders in front of the contused spot (Chorioretinal lacerations with retinal detachment and proliferating retinitis). The macular region is also the seat of lesions by concussion, but the central and peripheral lesions encroach upon each other; the eye is distorted; the area of destruction goes from the posterior pole to the peripheral region situated in front of the spot in which the eye has been bruised.

Were these laws based upon theoretical considerations, only, they would certainly be lacking firmness, but they are established upon the study of facts, upon the clinical studies. It is the reason why we try to bring these laws to light.

PATHOGENY OF VISUAL DISTURBANCES

*First Group of Facts: (First Law).—*The disorders of the first group are explained by the commotion of the air-column shaking the ocular wall in the same manner as it shakes a door, the partition in a room, more or less violently according to the violence or to the proximity of the explosion. These lesions locate by preference at the posterior pole of the eye; they are sometimes very extensive, but predominate in the macular or paramacular regions. They are seated chiefly in the uveal tract, as all lesions by concussion. We shall see hereafter that the uveal membrane is the first to give way when the eye is shaken, without

being directly contused. The choroidal ruptures, very frequent in the macula, are lesions by concussion; the chorio-retinal lesions with rupture of both membranes are lesions by contact. This general data takes an important place in the pathogeny of intraocular traumatic disorders.

*Second Group of Facts: (Second Law).—*The visual disturbances of the second group may be explained by the disorders of the sensitive nerves (lacrimal frontal), of the various motor nerves and by the lesion of the optic nerve, resulting from the extension to these organs of radiating or rebounding fractures of the orbital vault. Atrophy of the optic nerve, following injury, is a common and well explained lesion.

*Third Group of Facts: (Third Law).—*On externally normal eyes, which have suffered at distance an injury involving the bony facial structures in a location remote from the orbit, we discover macular lesions. These are the result of vibratory concussion being transmitted to the contents of the orbit, through the medium of the ptergomaxillary fossa and fissure. The eye is lifted up, shaken, in the same manner a ship is shaken, by a ground-swell arising under its bottom. It is quite probable that this concussion of the entire adipose system (or better said of the fatty mass almost fluid at the temperature of the body) is the cause of the ruptures taking place in the inner membranes. How can we understand that these disorders are often exclusively macular and that when ruptures exist elsewhere, the most important lesions are to be found at the posterior pole? It is possible to explain such a localization—firstly, by the fact that the macular region is the most delicate and the most liable to injuries and traumatisms; secondly, especially because the eye, shaken, tossed, thrust forward as it is by the oscillating wave arising in the interior of the orbit, is held back, twitched, by the optic nerve firmly fastened to the apex of the orbit. These twitching motions act chiefly on the entire posterior pole and, for this reason, the ruptures and hemorrhages are easily produced in this particular spot. It happens sometimes that individuals whose face has been severely bruised, lose the central vision without visible lesions in the macula. We must not consider them as malingerers, the central scotoma being explained by the existence of disorders the ophthalmoscope cannot reveal.

*Fourth Group of Facts: (Fourth Law).—*The disorders of the fourth group, which follow the depression, the more or less marked thrusting in of either wall of the orbit, are to be explained by the same mechanism and we may understand that they are more marked than when the missile went through the bony facial structures without impairing the shape of the orbital cavity. In these cases it is not the basement, so

to speak, which is injured; but the pillars and the sides. We understand easily that the organs contained in the orbital cavity are more deeply injured by disorders splitting or perforating the walls and pillars of the cavity. In this fourth group we find macular lesions which are explained by the above described mechanism, but there exist also vast chorio-retinal lesions resulting from the impetus of the impact of the fluids. These lesions are adequate in importance to the depression of the orbital walls and to the violence of the injury. These lesions are remarkable from the standpoint of localization, because they are always situated in front of the orbital fracture. The wave which shakes the soft tissues, starts from the fractured region and by a sudden and violent shock strikes the eye situated opposite and ruptures the membranes. We must observe that, chiefly and above all, the rupture injures the choroid which bleeds; the blood lifts and detaches the retina. When this latter membrane is itself ruptured there arises a proliferating chorio-retinitis. On the whole, in the fourth group we find: 1. A distinct macular lesion. 2. A choroidal laceration (mostly choroidal and retinal together), in front of the fractured orbital wall.

Fifth Group of Facts: (Fifth Law).—When the missile travels through the orbit without injuring the eye, it can, of course, cause disorders which vary to a great extent, according to the injured organs (muscles, motor, sensitive and sensory nerves). It happens sometimes that the same bullet goes through both orbits and cuts both optic nerves behind the eyeball. When the optic nerve has been cut or violently contused, we find gross lesions at the posterior pole. These lesions are the result of the traction imparted to the posterior hemisphere of the bulb by the shock which the nerve suffers. This shock, before rupturing the nerve and at the same time it contuses it, forces it violently in the direction followed by the missile and, so to speak, tries to detach the nerve from the eyeball.

Sixth Group of Facts: (Sixth Law).—The sixth group of ocular disorders consists in a direct contusion of the eyeball without rupture of the envelopes, by a missile passing tangentially to the eye, grazing it in some manner. In this case we always find disorders exactly in front of the spot where the bullet touched the eye. These are lesions by contact, represented by the rupture of the choroid and retina. Very often both membranes are simultaneously ruptured by the violence of the injury; the disorders are very extensive and are located at the level of the injured spot and radiate easily toward the macular region. Accordingly the macula is in such cases often involved, but not alone and separately. In these patients very extensive alterations of the eyeball disorganize the eye without rupturing it. If the bullet passes quite

close to the eye, the latter is, of course, destroyed as it bursts. But, we do not speak of the ruptures of the eye. Our sixth group is formed by cases in which the eyeball is directly contused by a missile grazing it in its course, without rupturing it. We must expect, of course, to find in such cases the most pronounced disorders in the inner membranes. From the contused spot in the eyeball lacerations start toward every region, especially toward the posterior pole, the most liable to traumatism.

The visual disturbances arising in the cases in which the fracture of the orbit is complicated by the presence of foreign bodies, are explained in the same manner as in the two last groups. In all perforating wounds of the anterior segment of the eye the first indication is to close the wound and to protect the eye against infection by covering the wound with a conjunctival flap after as thorough a conjunctival toilet as possible. Intraocular foreign bodies have occurred in such relatively enormous numbers during the present war, that more definite conclusions as to their removal and the treatment of their associated conditions are beginning to shape themselves more definitely than has ever been possible from their semi-occasional incidence in civil practice. No intraocular search for a foreign body is justifiable without a careful roentgenographic study of the eye and orbit from different angles, and its early use may determine the success of the treatment.

The presence of one or more small foreign bodies in the eye does not mean, of necessity, the loss of the eye or great reduction in its vision. Often, in fact, a surprising tolerance to foreign bodies is seen, particularly in the case of fine particles of dust and stone or similar chemically indifferent bodies, and the enormous experience of this war seems to show that the presence of any kind of a sterile foreign body in the eye has no relation to the production of sympathetic ophthalmitis. Pano-phthalmitis is said to follow penetrating wounds of the globe in about one-seventh of the cases and evidences of the infection appear usually about three days after the injury. A freshly shattered eye is best enucleated by the surgeon in the field, the bulbar tissues removed while easily recognized and the muscular and conjunctival relations restored in so far as possible, with a view to use them as the bed for a future prothesis.

Orbital cellulitis of nearly every possible type and degree follows the introduction of foreign bodies into, or their passage through, the orbit, as well as communication with the accessory sinuses through fissures or fractures. The cases of localized orbital abscess usually develop in orbital hematoma and less often about retained foreign bodies, and may begin in a few days after the injury or may be delayed for several weeks.

Traumatic exophthalmos, both of the simple and pulsating varieties, is not seldom seen as an ante-mortem result of bullet perforations of the middle fossa.

Lesions of the upper cranial nerves and particularly of the ocular nerves as a group, are far more common in projectile injuries of the head than is seen in industrial traumata.

Viewed from the combined clinical, anatomical and operative stand-points, the most significant classification of projectile cranial wounds in general seems to be: (Mills).

1. Scalp wounds without definite external signs of fracture of the skull.

2. Depressed fracture without injury to the dura.

3. Fracture involving the dura, but without infection or lodgment of foreign bodies.

4. Fracture involving the dura, with infection and with foreign bodies in the brain.

5. Fractures and fissures of the cranial fossae, either complicating fracture of the vault or as the result of direct injury.

Every injury of the skull is, for a long time, a source of potential danger and the persistence of any sign or symptom, however trivial, is to be looked upon with suspicion. The diagnosis of fracture may be usually established with absolute certainty. If no bony injury is found, the wound is sutured without drainage and heals by primary union in over 95 per cent of the cases. Time, trouble in attendance and expense in dressings are saved. Skull wounds, even in the stage of concussion, stand travel fairly well; but not at all well after operation. Every fragment of bone and foreign body should be removed the moment it is felt, taking care not to enlarge the dural tear too much, lest the limiting adhesions be torn. Numerous observers have removed metallic foreign bodies, such as fragments of bullets and shrapnel from the brain with a minimum of trauma by the use of a giant magnet and at times under direct Roentgen-ray control. Drainage is indicated in the presence of pus, of infected blood clot, of definitely infected but inaccessible foreign bodies and where there is free oozing from an extensive laceration of the brain.

Perforating wounds of the skull in which immediate death has been escaped, usually recover without operation, although in some of the more severe cases it is necessary to trephine both the wound of entry and that of exit, where wide fissures and extensive contusion of the brain may exist. Fractures of the base of the skull from direct projectile injury are seldom operable and must be treated expectantly, or, upon the signs of beginning infection, suboccipital decompression

and drainage of the subarachnoid space may be done. Lumbar puncture is one of the most valuable aids in the diagnosis and treatment of projectile injuries of the skull.

Optic neuritis after cerebral injury, becoming progressively more severe, is to be considered as a grave sign and the observation of changes in the disc by a trained ophthalmologist will often decide for the surgeon as to the advisability of reopening the wound, the significant factor in these cases being the increase in the optic neuritis, not the mere fact of its existence. If, therefore, in cranial injuries no other symptom furnishes an indication for trephining, that of choked disc alone should not be an indication for opening the skull.

The most characteristic and possibly the most striking of all cranial injuries, are the contusions and the tangential wounds over occipital poles, which cause central blindness and all manner of permanent and transitory defects in the visual fields. Research of the visual field is necessary in all cases of occipital trauma, regardless of their apparent triviality. The noticeable feature of occipital injuries is that the principal defect is visual rather than nervous.

The hemianopsias of civil differ from those of military life, in that they are nearly all directly or indirectly of vascular origin. These hemianopic defects are strongly symmetrical except when the eyes have become fatigued by the examination, but that the intensity of the functional disturbance is both absolutely and relatively different in the two eyes. In some cases a functional concentric contraction of the less affected field occurred, but soon disappeared. In the battle injuries to the skull from blunt weapons like clubbed rifles and in accidental fractures of the skull caused by falling walls, cavalry accidents, artillery crushes and falls into trenches, the ocular lesions and ocular complications which arise in the course of infections or thrombosis of the large basilar venous sinuses are naturally identical to those which so frequently follow blunt violence and related accidents in civil life. Irritative, corrosive and asphyxiating gases have been reintroduced into warfare during the late conflict, the gases of chlorine, bromine, sulphurous anhydrid, sulphur dioxide, nitrogen tetroxide, ammonia and formol having been employed deliberately, while lethal quantities of carbon monoxide appear to be set free in the chemical action produced by the explosion of high-explosive shells. The main effects of these are a traumatic or chemical conjunctivitis.

The general care of battle wounds of the eyes and the optic apparatus presupposes some knowledge of the conditions of employment of shrapnel, shells and bullets, of the mechanism of their action, of their

characteristic effects upon living tissues of the head and of the general principles of treatment of military wounds.

1. Shrapnel, which is responsible for about three-fourths of all artillery wounds in mobile warfare, consist of cylindro-conoidal casings of cupro-steel weighing from 15 to 20 pounds, containing from 300 to 500 round lead bullets, usually hardened with antimony, from 1 to 1½ cm. in diameter and weighing from 10 to 16 grams each. Shrapnel in the ordinary accepted sense of the term consists of a shell casing with a fuse and a base charge behind the bullets. At the end of the determined flight which is regulated by the punching of the fuse, the head of the shrapnel is blown off, the charge at the base is exploded and the bullets come out from the open end of the unexploded shell with a velocity of the remaining force of the propulsive charge and the energy imparted by the detonation of the base charge. The casing continues in its flight unexploded save for the loss of the conoidal head until the energy of the propulsive charge is exhausted, when it falls intact. The damage is done by the bullets themselves which are dispersed at the time of explosion in an angle of 14 degrees.

High explosive shrapnel bursts into from 2,000 to 3,000 fragments, varying in size from large, irregular pieces of casing possessing all the terrible lacerating effect of solid shot, to jagged lumps of metal, fine, sharp slivers and tiny dust-like particles. This type of shrapnel has been largely given up by artillery as not being particularly effective.

2. Shells, among which are included bombs, grenades of all kinds and, from their similarity in effect, mines, range from sizes scarcely larger than shrapnel to great cylindro-cones of steel as tall as a man and weighing over a ton. The cavities of these iron and steel casings enclose a violent explosive charge, which, in the case of bombs and grenades, is often partly replaced by irregular metal fragments of all kinds, as well as by corrosive fluids and irritant and poisonous gases.

3. Bullets cause the majority of the more serious wounds of the eyes and optic apparatus, as is shown by the fact that not more than 25-30 per cent of eyes wounded by bullets can be saved, whereas about 60 per cent of those injured in explosions of artillery missiles are conserved, although the vision in all of these retained eyes is usually much impaired.

The modern bullet tends to lose its shape and break in fragments upon meeting slight obstructions, because of the difference in the density of its core and its thin outer coat or jacket.

The bullets of modern rifles, machine guns and high-powered revolvers produce nearly identical effects upon the orbital region and the cranium, at short range

Careful clinical and bacteriological study of battle wounds has solidly established the following facts:

1. The prevention and cure of infection constitute the greatest single problem of military surgery.

2. Little or no bacterial growth occurs in projectile wounds during the first four to six hours following injury. Such as does occur comes mainly from implantation of organisms with the projectile or secondary missiles, and where these wounds can be effectually opened and cleansed of foreign material before bacterial growth extends to and into the surrounding tissue, infection does not occur, or is almost negligible.

3. Wherever, from the nature of the wound, it is possible to excise the bruised and contaminated tissue about the path of the missile, the usual result is primary union.

4. If, owing to faulty transport, excessive casualties, or extreme shell shock or exhaustion, prompt surgical care is impossible and infection spreads to all parts of the wound, free incision, adequate drainage, the use of light dressings, frequently changed, and continuous irrigation offer the surest means of recovery.

Gas bacillus infection of the orbital regions fortunately is rare, for the rapid and often dramatic spread of the bacillus *perfringens* beneath the scalp makes it exceedingly difficult or impossible of control in this location. The condition and subsequent treatment of the wounded often is more dependent upon the degree of their psychic and physical exhaustion than upon the nature and extent of their wounds.

Wounds of the lids and adnexa very often complicate lesions of the globe and of the face, and the problems of plastic surgery which arise out of their injury frequently tax the ingenuity of the surgeon to the utmost. Powder burns of the lids, conjunctiva and cornea are the result of the premature explosion or careless handling of artillery fuses, trench bombs or grenades. They produce leucomatous markings upon the cornea, but seldom tattoo it.

Bayonet wounds make up practically all of the incised wounds of the lids and eyes. A direct lunge into the orbit is practically always fatal, at once, from cerebral laceration and uncontrollable hemorrhage, but for the most part the rather infrequent bayonet wounds of the orbital region, which survive to reach surgical aid, are received during sharp parries and most of them are merely superficial slits of the lid margins, with or without perforation of the eye. As bayonets are frequently used as accessory trench and camp tools, their wounds are nearly always infected.

Wounds of the orbit and orbital tissues, while more often the result of fragments of artillery projectiles and their secondary missiles, are

usually of a more serious nature when caused by bullets, especially at the closer ranges, and associated lesions of the eyeballs, the optic and other ocular nerves, the nose and accessory sinuses and of the anterior and sometimes the middle cranial fossa are seldom lacking and occur in every possible form and combination.

To devise plastic operations to lessen the disfigurement and to enable artificial eyes to be worn, is the final work of the ophthalmic surgeon on these cases, and it must be kept in mind constantly that the time for bone-grafting, for cartilage implantation and for the replacement of soft parts by fat transplantation, which are the foundations of this work of restoration, is before vicious fibrous or bony union has taken place, and further, that cicatricial over-effect following operation must be watched for and treated by long, patient and often painful effort, frequently lasting over months.

Indirect injuries of the eyeball make up over 6 per cent of all battle injuries of the eyes in present day warfare and are of two forms:

1. Injuries which are purely the result of air contusion or air decompression, consequent upon the bursting of high explosive shells in the near neighborhood. The effect of the terrific explosions and artillery missiles upon the cortical visual centers and the optic pathways in the brain is discussed under the heading of traumatic ocular psychoses of battle.

2. Another group consists of indirect lesions in which the ocular coats have been detached, ruptured or otherwise seriously injured by contusion, penetration or perforation of the orbital cone by projectile or other injury, with no possibility of contusion of the globe, either directly or through the lids, or secondarily by fragments of bone driven from the orbit.

Retinal detachment occurs in a surprisingly large proportion of these indirect injuries. Direct injuries of the eyes are obviously less frequent than injuries of the adjacent parts of the face with their broader area of exposure. Wounds of the globe by fragments of artillery projectiles, and especially those produced by the various forms of trench and hand grenades and by the explosion of mines, so constantly associated with the caving in of trenches and earthen shelters and more or less complete entombment, are almost invariably complicated by the presence of more or less numerous secondary missiles set in motion by the explosive force.

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CASE REPORTS

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SOME SUGGESTIONS IN THE TREATMENT OF OPERATIVE CASES

NOTHING new is offered in the following suggestions for they have been advocated by a few for years, yet have not been generally adopted despite some of their obvious advantages. How many of us ask ourselves why we purge our patients, usually with oil the day or night previous to operation or why we put them on a restricted diet? Are we not taught that our patients should go to the operating room tranquil in body and mind, yet how many of us feel in our normal mood if we go practically without food for twenty-four hours and sustained only with thirty to forty-five c.c. of castor oil? What is accomplished by such treatment? Only this: The patient usually has a miserable night, the tone of the bowel is so disturbed that it requires at least forty-eight hours to become normal, even if the patient were not subjected to operation, and the blood pressure lowered on an average fifteen m.m. Certainly none of these conditions is desirable, especially in seriously ill patients. During the past seven years, most of which time I have been at the head of a more or less large surgical service, except in a few cases with special indications, the patient is allowed to continue on a normal diet and is given no purgative. The morning of the operation no breakfast is given unless a cup of tea or coffee is desired. In practically all abdominal cases the lower bowel is emptied with a plain S. S. enema. Here again, how often is the physiology of the bowel considered when an enema is ordered? It is still almost universally taught to our nursing staff that there are two enemata, i.e., high and low; the former given with the long rectal tube and the latter with a small rubber nozzle. If fluid is desired in the entire large bowel there is only one way to get it there and that is, by reversed peristalsis, which certainly cannot be attained by irritation with a long tube.

Let us learn from our X-ray confreres how to give an enema. Watch their technique of filling the large bowel with a bismuth solution and then follow that same method in all cases. The patient lies in a comfortable position on the left side, hips slightly elevated and thighs flexed on the abdomen. The smallest hard rubber nozzle, dry, is placed gently, by sight, squarely in the center of the patient's anus after he has been told to strain as in defecation. As he relaxes, the nozzle is pushed gently upward for a short distance where it is held firmly by the sphincter. The fluid, at body temperature, is allowed to flow gently and

slowly in from the container, which should be held about eighteen inches above the level of the nozzle. Upon the slightest evidence of "griping" the flow should be stopped until it has passed away. With a little patience and tact on the part of the nurse and by making haste slowly an enema can be given that is really a "high" one. The long rectal tube has one use only, and that is where it is desired to set up an active peristalsis to relieve gas, and even then I prefer the above method.

Can there be any improvement made in the after treatment of patients? I believe so. Possibly not in any way that will greatly affect the mortality rate but in ways that will most certainly add to the comfort of our patients. Some surgeons advocate the routine washing of all stomachs following ether anesthesia. This I believe is unnecessary, but it most assuredly should be done when the patient has taken the anesthetic badly. When there has been vomiting, the stomach is ballooned with gas or contains food. Should our patients be given water during the first few hours following anesthesia? Here, I realize, I am treading on dangerous ground; considered dangerous, I believe, largely from tradition rather from any actual disaster that surgeons have witnessed. "Jeff's" repeated admonition to "Mutt" should be applied, "For the love of Mike, use discretion." With a few rare exceptions my patients are given water, in small quantities, as soon and as often as it is asked for. As to the diet, immediately after abdominal operations no hard and fast rule can be laid down. For the first twenty-four hours I give nothing but water in all cases, after that time each case is considered on its own merits, but the desires of the patient can be followed safely in most cases. No routine purgation is used following operations for the same reasons as outlined prior to that event. Dependence is placed entirely on enemata.

Should any one be doubtful as to the efficiency of the procedures outlined let him try it over a long series of cases and I am sure he will never again go back to the old routine. There at least will be no increase in the death rate, and the cheerfulness with which one's patients greet him on the morning of the operation, their freedom from the agonizing post-operative thirst and the almost total absence of gas-pains will more than repay him for the change.

The following method of skin sterilization is reported, not because it is new, but as it is so superior to iodine, in being free from all irritative properties that it should be generally substituted for it.

Picric acid six grams, alcohol 70 per cent, 100 c.c. This solution is used upon the skin in the same manner as tincture of iodine. In addition I have been using a rubber solution composed of ordinary bicycle cement 1 part, and ether 6 or 7 parts. A small quantity of this is poured

upon the skin and spread over it completely with some metal instrument, a large curved hysterectomy forceps usually being used.

This solution dries within a few seconds, does not have to be removed, as it forms only the thinnest film, aids in the application of adhesive plaster for the after-dressing, and keeps the skin absolutely free from perspiration, even during a prolonged operation.

This method of skin sterilization has been used by me during the past year in a series of several hundred operations without a single infection in a previously clean case.

BRAIN ABSCESS

The following case of brain abscess is reported because of the infrequency of its type and the result obtained following operation.

J. J., Major, Reserve Corps, age 53; occupation, hydraulic engineer; no history of any previous illness and with negative family history was admitted to hospital at 8 p.m., March 12, 1920, and the following history obtained from his wife. Previous to Feb. 29, 1920, the patient had been in his usual robust health. On that morning he had gone to the Polo Club grounds near his home to engage in trap shooting. Upon firing the first shot he felt a sudden intense, lancinating pain in his head and became very dizzy. He was taken to his home, but did not at once call medical attendance. The headache and dizziness increased in severity and on March 3, a local physician was called. Despite medical treatment, consultations and diagnoses of "Cerebral Toxemia," "Hysteria," and "Nervous exhaustion," the symptoms continued to increase in severity. He became stuporous on March 9, but could be aroused at intervals.

Upon admission to hospital he was comatose; supra-orbital pressure obtaining only a muttering response. Pulse 74, full, strong and regular. Temperature 100. Respiration 20. Blood pressure 130 mm. Pupils equal and reacted to light. Tendon reflexes normal. Involuntary urination and defecation. Urinalysis of a catheterized specimen showed specific gravity 1.020, trace of albumin, some granular casts, no sugar. White blood count 27,000, Poly 94 per cent, small 5, large 1. No provisional diagnosis was made that night and no treatment given besides sixty c.c. Mag. Sulph. March 13 the comatose condition was more profound and the temperature higher. Spinal puncture revealed a normal fluid not under pressure. During the afternoon the patient developed slight spasticity of the right arm and twitchings of the entire right side. The pupils became slightly unequal and the left did not respond rapidly to light. About 8 p.m. there developed a flaccid paralysis of the left arm. A diagnosis of brain abscess was

now made. By 11 p.m. white blood count had increased, the temperature risen 103, pulse 110, respiration 40 and characteristically Cheyene's-Stokes in type. The patient was in extremis. Consent was readily given to an operation.

The question of localization was then paramount and was decided in favor of the site selected owing to one symptom, which his wife upon questioning, stated had been present from the first i.e., a gradually increasing speech defect. The patient was prepared for a craniotomy, which was performed at 12.20 a.m., March 14, 1920, without anesthesia.

An elliptical incision was made in the left temporal region and a one c.m. opening made through the skull with a Hudson bur directly over the speech center. Upon exposure the Dura mater was bulging and black in color. An incision made through it evacuated about thirty to sixty c.c. of fluid pus under marked pressure. The fluid was characteristic in color and odor of an infected liquified blood clot. Upon exploration the cavity containing the fluid was found to be about 2.5 cm. deep and the same in diameter. A soft rubber tissue drain was inserted and the wound closed.

The effect upon the patient was astounding. He aroused at once sufficiently to inquire in no uncertain terms as to what we were doing to him and by morning he could answer questions intelligently. Convalescence was extremely rapid. The wound drained freely for forty-eight hours and closed by primary union. At the end of seventy-two hours the temperature and pulse were normal, headache and speech defect gone and mind clear. He was discharged on April 4, 1920, and shortly thereafter resumed his usual work. During the sixteen months that have elapsed since the operation he has been absolutely free from all untoward symptoms.

The probable sequence of events was: Rupture of a small cerebral vessel, due to or coincident with the firing of the gun. The resulting clot passing through the usual liquifying process and later becoming infected through the blood stream from some secondary focus; most probably from some carious teeth, part of a bridge in the upper right jaw.

RECURRENT DISLOCATION OF PATELLA

The following case of recurrent dislocation of the patella is reported owing to its infrequency and to the excellent result obtained from the operative procedure used.

Mrs. F. M., age 22; occupation, nurse; family history, negative; has been troubled more or less with weakness of the left knee since childhood. The patella first became dislocated in 1915, about the end of

her first year in a nurses' training school during which time she had increased very rapidly in weight. Since that date the dislocation has recurred at frequent intervals, necessitating the wearing of a knee brace for considerable periods of time and causing almost total incapacity. The dislocation usually occurred while turning or twisting with the knee slightly flexed.

The patient was five feet four inches in height, weighed one hundred and ninety five pounds. All joints of both lower limbs were extremely lax and flexible. With the leg extended the patella could be easily dislocated to the outer side. X-ray pictures showed a very marked deficiency in the external condyle, giving the appearance as though the lower end of the femur was rotated outward. After a careful study of all the available literature the Albee operation was selected as the one offering the greatest possibility of a cure.

Operation October 25, 1920. Ether anesthesia. A large elliptical incision extending from the tibial tubercle to four inches above the outer condyle of the femur was made and reflected upward, completely exposing the knee joint and the lower end of the femur. An incision two and one-half inches long, three-fourths of an inch below the cartilaginous edge of the outer condyle and nearly parallel with the long axis of the femur was made with the Albee circular bone saw. A large flat osteotome was inserted in this incision and the outer condyle fractured upward. A section of the crest of the tibia, one and one-half inches long and about three-fourths of an inch deep was removed and inserted in the line of fracture. The entire crest of the tibia was used and when inserted flush with the surface of the femur, separated the fracture line about one-half of an inch. As the inserted graft remained in position so easily no bone peg was used to retain it, but for safety's sake, holes were drilled through the upper and lower edges of the fractured condyle and the inserted graft held in position with chromacized kangaroo tendon.

Owing to the extreme laxity of the patella ligament it was cut transversely above its insertion into the tibia and overlapped about three-fourths of an inch, thus shortening it about one and one-half inches. A reef was also taken in the inner side of the capsular ligament. After careful attention to haemostasis the wound was closed without drainage and the leg incased from hip to toes in a previously made posterior plaster splint.

Convalescence was uneventful, the knee showing very slight reaction to the trauma inflicted. Primary union was obtained and passive motion of the knee begun at the end of three weeks. At the end of five weeks slight weight bearing was allowed, and full use rapidly encouraged.

Examination July 15, 1921, practically nine months subsequent to operation reveals a knee with normal mobility and perfect function. Upon manipulation the patella rides snugly between the condyles and when an attempt is made to force it outward, can be felt to strike strongly against the outer condyle.

Since the operation, for the first time in her life the patient has been able to use her knee in a perfectly normal manner. Owing to this fact she has been indulging rather strenuously in dancing, swimming, and walking and the right patella owing to its excessive use has dislocated a few times but the reactions from these dislocations have been very mild as compared with those formerly following the dislocations of the left patella. X-ray pictures also show a deficiency of the external condyle of the right femur.

The technique of the Albee operation was followed except that the incision in the femur was made with a bone saw and the patella tendon was shortened. From among the multiplicity of operations offered for this type of condition in the various text books, it is believed that this type of operation is the one that should supplant all others, as it restores the external condyle to a normal position and when free from infection, as it should be with proper operative technique, offers very little chance of injury to the knee joint. The laxity of the patella tendon, due to the frequent stretchings, should be overcome by shortening in the manner noted.

ACUTE HAEMATOGENOUS INFECTION OF A SINGLE FUSED KIDNEY

The following case is considered to be of such rarity and interest as to warrant its report.

Private J. G.: Age 19, service one year, was admitted to the hospital May 7, 1920, and discharged May 11, 1920, with the diagnosis of an acute catarrhal bronchitis. His temperature upon admission was 103°, with marked prostration. He made a rapid recovery, his temperature and pulse being normal on May 9. Urinalysis made this date was normal. He returned to duty May 11 as cured, apparently in his usual good health.

The following morning he awoke with a severe pain in the middle upper abdomen and back. This pain rapidly increased in severity and he was readmitted to the hospital at noon.

Upon admission the patient looked acutely ill. Nausea and vomiting were present and increased in severity until operation. Temperature 101, pulse 90, white blood count 10,500. The abdomen was somewhat tender and slightly rigid, and upon deep manipulation a spherical tumor could be felt in the median line and slightly above and to the right of the umbilicus. The bowels had moved in the morning.

but no results could be obtained from enemata after admission to hospital. The soldier was catheterized to eliminate the possibility of the tumor being a distended bladder.

As the temperature and pulse were gradually mounting and the tumor rapidly increasing in size an exploratory operation was decided upon and performed at 8 p.m. Anesthesia, ether. After the anesthesia was complete, and prior to opening the abdomen the tumor could be readily detected by the eye and clearly outlined by manipulation. A right rectus incision was made directly over the tumor, which proved to be retro-peritoneal and about $4 \times 2\frac{1}{2} \times 6$ inches in size, directly over the median line but extending slightly over to the right. The aortic pulsation was strongly transmitted through it.

The tumor was very dense, somewhat glistening, and bluish mottled in color. Aspiration with a needle was done, but no fluid was obtained. It was then cautiously incised and proved to be kidney tissue. The diagnosis of a fused kidney was made by the absence of the kidneys from their usual position. The capsule of this kidney was incised and the hemorrhage, which was very free, was controlled by hot moist packs. The split in the capsule was then partly closed with catgut sutures. A soft rubber tissue drain was inserted and the abdomen closed in layers. The drain was removed at the end of forty-eight hours and the soldier made a rapid and uninterrupted recovery. The tumor rapidly decreased in size and at the end of ten days could not be felt except upon deep manipulation.

Urinalysis made on day following operation showing a specific gravity of 1.027, albumin positive and heavily loaded with cellular casts. The urinary findings rapidly dropped to normal.

The correct diagnosis and treatment of this case was largely made possible by an experience with a similar but less puzzling case in 1914. At that time I was called in consultation to see a woman who, one week following an abortion, developed a severe pain in her right lumbar region accompanied by a rapidly developing tumor, high temperature, frequent pulse, high white blood count, albumin, casts and blood in the urine, nausea and vomiting, and extreme prostration. Operation at the end of twenty-four hours from the onset revealed an enormously swollen and congested kidney. This kidney was completely incised longitudinally, hemorrhage checked by hot moist compresses, drain inserted, capsule closed with catgut sutures, the kidney replaced and the wound closed. The drain was removed at the end of forty-eight hours and the woman made an uninterrupted recovery. The urinary findings rapidly became normal. The literature of acute hematogenous infections of the kidney is extremely meager.

The treatment is immediate surgical intervention. As the onset of these cases is sudden, the development so rapid and the symptoms so severe, these cases are seen by the attending physician within a few hours of the onset. If operated upon during this stage of intense congestion the kidney may be saved by free incision. At a later stage a nephrectomy will be demanded.

No X-ray pictures could be obtained in the case reported, as the soldier absolutely refused all instrumentation.

STRANGULATED RETRO-PERITONEAL HERNIA

The following case of a strangulated retro-peritoneal hernia is reported owing to its rarity, especially as it was associated with a large Meckel's diverticulum.

Private B. H. S. was first seen by me about 11 p. m., April 6, 1920, and gave the following history: Age 20; three years service, occupation chauffeur, family history negative, has had no disease of childhood and states he has never been ill previous to the present attack. No history of acute or chronic gastro-intestinal disturbances.

About 3 p. m., April 6, 1920, he was seized with a sudden severe pain in the abdomen. Nausea and vomiting developed at once and increased in severity until operation.

Physical examination revealed a greatly distended abdomen, markedly tender and with boardlike rigidity. Temperature 97.6, pulse 96. The picture presented was that of an acute intestinal obstruction and he was prepared for an immediate operation. Anesthesia ether. Abdomen opened through a median incision. The presenting small bowel was found greatly distended and a large quantity of free fluid in the abdomen.

To arrive at the pathology, the small bowel was traced downwards and practically the entire ileum was found in the cavity of an ileo-caecal retro-peritoneal hernia. After delivering the bowel the entire hand could be inserted into the cavity. The opening appeared beneath a heavy band following along the course of the right external iliac artery. Numerous small areas of beginning gangrene were found in the small bowel, due to compression by the edges of the sac. Two of these areas were sufficiently advanced to require suturing. A large Meckel's diverticulum was found as a part of the contents of the sac. Owing to the large size of the hernial opening and to the patient's general condition no attempt was made to close the cavity. The abdomen was closed in layers reinforced with through-and-through silkworm gut sutures.

The patient made an uninterrupted recovery and was discharged from the hospital April 29, 1920.

REPORT OF TWO CASES OF INTESTINAL OBSTRUCTION BY MECKEL'S DIVERTICULUM OCCURRING IN THE SAME INDIVIDUAL AND COMPLICATED BY ACUTE APPENDICITIS

By DEAN F. WINN
Major, Medical Corps, U. S. Army

J. W. H.—private, company K, 27th Infantry, aged nineteen years. Nothing relevant in family history.

For several months he had had fleeting pain in abdomen. This pain always disappeared after taking a cathartic. About 2.30 p. m., November 9, 1920, while riding on a wagon, he felt sharp pain about his umbilicus. The jolting of the wagon increased the pain. He reported at once to his regimental infirmary where he obtained a dose of Epsom Salts from an enlisted attendant. The pain continued, increasing in severity, and he was transferred to Sternberg General Hospital.

Physical examination. Upon admission he was doubled up with abdominal pain and was vomiting. Temperature 98, pulse 84 and respiration 20. Anxious expression. Very little distention but tympanitic in lower abdomen; moderate general abdominal rigidity; no masses; liver and spleen not palpable; tenderness marked at McBurney's point and slight tenderness just below umbilicus. Heart and lungs negative. Urine negative. White cell count 17,000 with 86 per cent polys.

Diagnosis: Acute appendicitis.

Operation was done three hours after admission. Right rectus incision. Appendix, six inches long, acutely inflamed in distal two inches, and markedly kinked at middle and base by well organized adhesions; definite Jackson's veil present. There was a moderate amount of straw-colored fluid in the peritoneal cavity. Removal of the appendix was rendered difficult because the cecum and adjacent portion of the ileum could not be brought up into the wound. Further investigation revealed that the ileum was held down by a dense peritoneal band which was about a quarter of an inch wide. This band was traced with considerable difficulty and was found to be attached at one extremity to the blind end of a Meckel's diverticulum and at the other end, after winding around a group of small intestine loops, to the mesentery of the small intestine near its posterior attachment. The incarcerated loops of bowel could not be released until the band was cut. The diverticulum was eight inches long, of the same caliber as that of the ileum (both of

which were greatly distended) and was given off from the ileum about three feet from the ileo-cecal junction. The constricted intestine had a bluish, lusterless appearance but returned to normal color when the constriction was released. As the patient was beginning to show some degree of shock the diverticulum was not removed. The abdomen was closed without drainage and the patient made a normal convalescence. He was returned to duty on November 26, 1920.

Careful explanation of the nature of his trouble was made to the soldier and he was advised to submit to operation for removal of the diverticulum. Upon refusing operation he was urged to be sure to inform his attending surgeon of the presence of the diverticulum in the event of further trouble.

At 2.45 a. m. November 27th, (the following day), soldier was readmitted to hospital. He stated that after eating supper he developed abdominal cramps located in the lower left quadrant. He was seen by an enlisted man at his Regimental Infirmary who gave him a dose of epsom salts. The pain then shifted to his upper abdomen and became progressively worse. After admission to the hospital he vomited several times. His abdomen was not distended and his facial expression was good. A high turpentine enema followed by one ampule of pituitrin produced a good bowel movement. This relieved his pain and vomiting. During the day his temperature remained normal and his pulse rate did not rise above 116. Late in the afternoon his temperature and pulse rate began to rise, and vomiting and pain about the umbilicus recurred.

Diagnosis: Intestinal obstruction.

At 7.30 p. m. the abdomen was opened through a middle line incision. Almost identically the same condition found as was present at previous operation, a band of omentum having become attached to the tip and side of the diverticulum. Several loops of darkly colored distended bowel were incarcerated by the omental band. The omentum was resected and the diverticulum removed. A normal convalescence followed.

Remarks. The first operation would have been expedited and the second operation probably obviated had the obstruction been recognized and attended to before the appendix was removed. However, the distended gut was not in sight (lying largely within the pelvis and left side of the abdomen) when the abdomen was opened, although it was recognized that the immobility of the ileum was abnormal, and it did not seem wise to explore the abdomen until the infected appendix had been disposed of.

In the *Annals of Surgery*, May, 1921, Coley and Fortune report a case of intestinal obstruction caused by Meckel's diverticulum and quote sixteen cases which have appeared in the literature since 1897. It is believed that this unusual instance, in which obstruction of the bowels by Meckel's diverticulum occurred twice in the same individual, is worth recording.



HIGHER EDUCATION IN THE ARMY

By CAPTAIN ELBRIDGE COLBY, *Infantry*

THERE are two prevalent fallacies which deserve immediate consideration.

The first of these fallacies is that army officers are not required to apply themselves very vigorously during the periods between wars, and lead a monotonous and fairly inactive life.

The second fallacy lies in a popular misconception of the extent of Army education. "Oh, yes," says the man on the top of the bus, "you mean the Americanization work at Camp Upton and Camp Dix, you mean the vocational instruction that Secretary Baker and George Patullo have been talking about for a couple of years and that the recruiting details play up so sharp." As a matter of fact the full meaning of Army education includes much more than that. The vocational and educational training have been so well advertised and have secured so much publicity on account of their undoubted news value that the American people have come to look upon the Army solely as an educational project for enlisted men. Therein lies the error.

The explosion of these fallacies is readily accomplished in a single sentence. The Army is actually engaged in a more extensive educational program than the civilian dreams of, the thorough training of its officers in modern warfare on a scale comparable only to the work of our best technical universities and in a manner that requires diligent application and plain hard work. It is an educational program worthy of the high dignity, and suitable to the aims of, the profession of arms.

As Colonel Bishop, Chief of the Personnel Branch, has said: "In time of peace, the Army must be considered as a training school for officers."

When a man receives his commission in the Army, whether from West Point or from civil life or the ranks, he enters upon a course of instruction that extends over many years. While he is serving in the different posts with troops, he attends a garrison school in the winter and has practical work in the summer. But even this is not enough. There now are, in addition to the garrison schools, other schools which he must attend. Each branch of the service has its own schools, supplemented by the Leavenworth Schools. There is the Infantry School at Camp Benning, Ga., the Cavalry School at Fort Riley, Kans; there are special schools for the artillery, the air service, and the tanks. When an officer has successfully completed the course at that one of these

schools which corresponds to his branch of the service, he is then eligible for the still more advanced work in the General Service Schools.

"The General Service Schools consist of the School of the Line and the General Staff School at Fort Leavenworth, Kans., and the General Staff College in Washington. The full course covers a period of four years, the third year consisting of duty with troops of arms other than those with which the student has previously served. It has been decided to omit the third year for the present, and instead of sending the officers to serve with other arms of the Service they are given a brief course of observation and instruction at certain special service schools of other arms and will go directly then to the General Staff College. The matter of permanently reducing the educational course to three years instead of four years is now under consideration. The introduction of the single list and the opportunities for officers to serve with other arms of the Service made practicable by concentrating our troops in larger camps, would indicate that perhaps this year's work with other arms can be eliminated permanently. The General Staff College has been added, as will be noted, to the educational system as a genuine training school. The Army War College was hardly a training school but was rather a functioning part of or a division of the General Staff; and while a certain amount of training was given to officers detailed to the course at the Army War College, its work cannot be classed fully in the line of staff college training. The General Staff College, however, as now established, is the highest military training school of the Army."

Such is the work which an Army officer must go through. He goes to school for a year, then serves with troops for a time, then goes to the next higher school for another year, then serves with troops again, and so on, taking the more advanced work as he advances in age, experience, and rank. And all Army officers go through the same mill. The West Pointers, as soon as they graduate, leave their home on the Hudson and report to the Service Schools of their respective arms to take the first course—no exception even to West Pointers. The Colonel who commanded a regiment overseas finds himself going to school again in another course; the Colonel who was a Brigadier General in France finishes his year at school before taking command of his regiment. All have the courses to take in competition with their fellow officers. Furthermore, the word "competition" is not mere rodomontade. The work is highly competitive. Those who fall by the wayside and can not master the problems and principles of modern tactics and troop leading always face the danger of being placed in "Class B,"—a sort of probation list for the inattentive or inefficient. That is the punishment. And the rewards? Those who show their ability to learn and

their facility at maneuvering men will receive the prizes of the Army—command of troops. No technical college or university in the country has a clearer program, a more homogeneous student personnel or a more direct check on, and incentive to, all its members.

The program and the various courses of study are too large and complicated to give in detail, but two examples will show the kind of work that is being done and the immensity of the project in which the War Department has embarked. The two examples are the School of the Line at Fort Leavenworth, Kans., and the Infantry School at Camp Benning, Ga. The first of these is one of the higher group—one of the courses of the General Service Schools, and is taken by officers of rather advanced grades. The equipment at Leavenworth has presented comparatively little difficulty, because Leavenworth has been for many years the site of just such a school, with adequate living accommodations, and a useful library. The School of the Line course covers such subjects as military organization, strategy, tactics, troop leading, military history, psychology, laws of war, methods and means of transportation and supply, and staff duties. Its frame of mind is that of a Division. In the Staff School and in the Staff College higher units are dealt with. But when the School of the Line has got in its work with several succeeding classes of officers, all eager for ratings sufficiently high to designate them "Honor Graduates" or "Distinguished Graduates," our Army will be well provided in Division officers familiar with the proper employment and coordination of all units to be found in a division.

The Infantry School at Camp Benning, Ga., is of a different character. It trains all infantry officers in all weapons with which infantry is armed: rifle, bayonet, grenade, automatic rifle, mortars, one pounders, machine guns; and it trains them to cooperate with other branches of the service: tanks, artillery, aeroplanes, etc.

The work at Camp Benning is divided into five courses. Only four of these concern us much here, for the fourth course is given to non-commissioned officers designated for future duty with the National Guards, or with college units of the R. O. T. C. The others are a Field Officers' course, for one field officer per year from each regiment, a Company Officers' course, for one officer from each three companies; a Basic Course for all newly commissioned officers, including the West Pointers; and a National Guard Course. The last is three months in length, the others eight months. All of these courses are very exacting and very thorough. The book alone does not suffice, the arms themselves are handled and fired. Demonstrations and problems are carried out with live ammunition. When overhead fire is required, the guns actually fire with live cartridges. When cooperation with and from

other arms is required it is always real and not imaginary. Field artillery lays down a real barrage, tanks come through and really smash the hostile positions, the air service really carries messages and signals for indications of position. It is all an immense working plant.

The necessity of developing proper living accommodations at Camp Benning has been very pressing. The work of the school is now going forward on a large scale befitting the "finishing school" of the infantry—and we must never forget the importance of the infantry. That branch of the service suffers 89 per cent of the casualties in war. It is that branch of the service which takes and holds positions. Infantry is the "Queen of Battle."

The Camp Benning reservation comprises approximately 98,000 acres of land, thus permitting a modern battle to be staged in all of its successive phases, including the break through, consolidation, exploitation, and resumption of attack. Its climate is such as to permit training to continue the entire year—a consideration of vital importance at all times and especially in an emergency such as that through which we have just passed. The area permits the staging of the foregoing exercises without interfering with other technical training in progress within the area on the same day. Moreover, the area is such as to avoid indefinite repetition of the same problem, which repetition results in the fatal cut-and-dried method of attack and in destruction of initiative.

The terrain is thoroughly diversified, varying from level and open plain to every variety of hilly and broken country; one river, one creek, numerous small streams, and several small lakes furnish all of the water obstacles for the forcing of which infantry must train; there are both bare and wooded hills, clumps of trees, and comparatively thick forests such as will be encountered on almost any terrain on which infantry must attack, and the method of mastering them must be sought in a most thorough manner. For the teaching of rifle and pistol firing there is one tract, with proper back-stop, on which 1,200 targets may be placed for the simultaneous training of 1,200 individuals. There are ranges near by for the machine guns, hand and rifle grenades, automatic rifles, Stokes mortars, and one pounders, while the artillery and tanks may simultaneously carry on their tactical training with infantry by staging firing problems without in any way interfering with the simultaneous operations of the other arms. A complete trench system in suitable soil is being installed, thus permitting quick training in the methods of trench warfare, including artillery and machine gun fire overhead, with air service observation, and this without danger to anyone on the reservation.

Accuracy in the use of the various infantry weapons having been

attained, the terrain permits the simultaneous staging of field firing exercises in great number so as to preserve our great American asset, supremacy in the use of the rifle in attack. A terrain which does not allow this on a large scale is totally unsatisfactory.

The terrain at Camp Benning permits the artillery and machine guns to take up position behind the intrenched infantry and put down protective barrages at any moment of the day or night in response to signals from our troops in any front line trenches, just as was done in France; to lay down the creeping barrage in attack to the limit of range of the supporting artillery, and to cover the infantry as it digs in on its conquered ground, after which the artillery may push forward in support, take up a new position, and *continue the attack the next day*. This is the important consideration. The method by which we may prevent the dislocation of command, loss of control, confusion and disorder at the end of the first day, which so often brought operations to a standstill in the world war and neutralized the results of victory, must be known and practiced to the last detail by our modern infantry which, of necessity, suffers most of the consequences of the hostile reaction which follows attack.

Surprise was among the greatest of all factors in successful attack during the war. Night marches and night concentrations permit surprise. Concealment by day, marches into position by night, guided principally by the compass and map are necessary features of this phase of training. An extensive and partially wooded area is an absolute necessity for such work. Camp Benning provides such an area in a most satisfactory manner.

At such schools as Benning the officers of the Army are getting their specialized education. At such courses as are found in the School of the Line at Leavenworth, officers are fitted for higher command. The two groups of schools fit together into a system of Army education which shall mean a well trained Army for the next war. The schools do not presume to be able to train the nation directly, but they are training those who will instruct the next ten millions we have to call in the service—and are training them with particular emphasis on methods of training. They tell the student officers that above all things are two: the uniform adherence to an effective method, and the continual thought that every officer is a teacher who may be compelled to teach new levies with scant equipment. Talk about Technical Schools! Talk about schools of pedagogy, teachers colleges, and departments of education! The Army schools overshadow them all, do at the same time what both are doing, and perform their functions with a precision, with

a clear-cut interpretation of larger preparedness, and with a singleness of purpose unmatched by any academic institution in the world. This is education with a vengeance. And it is "Army Education" in the truest sense of the phrase—military in character, not merely given by the Army, and yet given on sound educational lines and with sound pedagogy.



ASSOCIATION NOTES

At a meeting of the Executive Council of The Association of Military Surgeons, September 3, 1921, the following names were proposed and elected to membership in the Association:

Medical Corps, U. S. Navy

Captain

Moulton K. Johnson

Commander

Frederick W. S. Dean

Barton L. Dwight

James E. Gill

Frank X. Koltes

Lieutenant Commander

William M. Kerr

United States Public Health Service

Surgeon

Bernard C. MacNeil

Thomas L. Richardson

Assistant Surgeon

Richard B. Norment, Jr.

Acting Assistant Surgeons

John C. Hubbard

Joseph Hall Jones

Medical Corps, U. S. Army

Major

Rowland D. Wolfe

Captain

William J. Burdell

Lewis A. Newfield

Tell C. Waltermire

Medical Reserve Corps, U. S. Army

Lieutenant Colonels

Frank Pierce Gardner

John Allen Hornsby

Majors

Jack Blumberg

Albert R. Goodman

A. Franklin Hutchinson

Lemuel J. Johns

F. S. Kidd

Robert A. Lambert

William B. Lewis

Walter N. Mereer

Theobald Smith

James Percy Wall

Captains

Lawrence D. Alexander, Jr.

Henry Clay

E. A. Ketterer

Charles H. McHaffie

Oscar L. Perkins

Benjamin Franklin Royer

Douglas S. Scrivener

John Henry Schroeder

Archibald A. Southwick

Samuel L. Stephenson

First Lieutenant

Emanuel Apostolides

Medical Corps, New York National Guard

First Lieutenant

John E. Kraft

Medical Corps, Pennsylvania National Guard

First Lieutenant

Frederick R. Bausch

Medical Corps, Connecticut National Guard

Captain

Voyle A. Paul

ASSOCIATE MEMBERS

Dental Corps, Florida National Guard

First Lieutenant

Carroll H. Frink

Dental Corps, Massachusetts National Guard

Captain

Schuyler R. Waller

REINSTATEMENT

Medical Corps, U. S. Navy

Commander

Montgomery Alexander Stuart

COLONEL WADHAMS—AN APPRECIATION

The unique tribute paid to Lt. Col. Sanford H. Wadhams by his associates in the Medical Corps on the occasion of his retirement from the service meets with a hearty response from thousands of officers of the old Medical Reserve Corps, who either came into direct contact with him in France, or, although they never met him, felt his pervading influence, and knew that he was the moving power in directing the widespread activities of the Medical Department of the A. E. F.

But we in New York who knew him before the war, when he was Inspector-Instructor of the National Guard, especially during the campaign on the border, never entertained the least doubt but that when he was called to a wider sphere of duty the modest, unassuming gentleman, whom we had learned to respect and esteem, would assume a pre-eminent position by reason of his inherent executive ability and knowledge of men and affairs.

The writer has enjoyed the rare privilege of being in close touch with Colonel Wadhams for many years, and had exceptional opportunities to watch his work in France. To him there has never been any secret about our friend's success in "putting over" whatever he undertook. If genius is "an infinite capacity for taking pains," he has always had it. If unceasing hard work, self-sacrifice, unswerving devotion to duty, render a man "fit to stand before kings"—he is that man.

We leave to his confrères, in the Medical Corps, a just appreciation of his executive ability and soldierly qualities, based on his twenty years of faithful service. To us citizen soldiers he was always human, always patient with our ignorance and incapacity, helpful, and optimistic, ready to listen to our complaints, and with swift and sure intuition to right our wrongs—a fine type of the officer and the gentleman, who was ever our example and our inspiration. Whenever his name was mentioned at the mess in camp and field there was never a word of envy or criticism. "Ask Wadhams, he knows" was the formula in every case of doubt and perplexity; and he did know.

The many former M. R. C. officers, who returned from abroad unhappy and disgruntled, feeling that their sacrifices and loyalty to duty had been unrecognized, will never know how deeply he sympathized with them, and how often he tried to obtain for them the commendation and promotion which they deserved. He was, and is, their friend.

He retires to take up new duties in civil life, and may look forward cheerfully to the coming years, which bring him the fruition of age: "To honor, love, obedience, troops of friends."

H. C. COE.

COMMENT AND CRITICISM

THE NATIONAL BOARD OF MEDICAL EXAMINERS

The *National Board of Medical Examiners* has just completed the first five years work, and with it the trial period of its usefulness. The principle which this Board has stood for, namely, the establishment of a thorough test of fitness to practice medicine which might safely be accepted throughout this country and abroad, has been widely accepted. Since this Board was organized by Dr. W. L. Rodman, in 1915, eleven examinations have been held. These examinations have been conducted on the plan of holding, at one sitting, a written, practical, and clinical test for candidates with certain qualifications, namely a four-year high-school course; two years of college work, including one year of Physics, Chemistry, and Biology; graduation from a Class A Medical School, and one year's internship in an acceptable hospital. These examinations have covered all the subjects of the medical school curriculum and have been conducted by members of the Board with members of the profession resident in the place of examination appointed to help them. Such examinations have been held in Washington, Philadelphia, New York City, Boston, Chicago, St. Louis, Rochester (Minnesota) and Minneapolis. During the war a combined examination was held at Fort Oglethorpe and Fort Riley. There have been 325 candidates examined, of whom 269 have passed and been granted certificates.

Starting with the endorsement of the Council on Medical Education of the American Medical Association, American Medical College Association, and various sectional medical societies, the recognition of the Army, Navy, and Public Health Service Medical Corps of the United States, and certain State Boards of Medical Examiners, the certificate is now recognized. Also by twenty States as follows: Alabama, Arizona, Colorado, Delaware, Florida, Georgia, Idaho, Iowa, Kentucky, Maryland, Minnesota, Nebraska, New Hampshire, New Jersey, North Carolina, North Dakota, Pennsylvania, Rhode Island, Vermont, and Virginia, the Conjoint Board of England, the Triple Qualification Board of Scotland, the American College of Surgeons, and the Mayo Foundation of the University of Minnesota.

There has been such a wide-spread demand for an opportunity to secure this certificate by examination that the Board has now adopted, and will put into effect at once, the following plan: Part I, to consist of a written examination in the six fundamental medical sciences: Anatomy, including histology and embryology; Physiology; Physiological Chemistry; General Pathology; Bacteriology; Materia Medica

and Pharmacology. Part II, to consist of a written examination in the four following subjects: Medicine, including pediatrics, neuropsychiatry, and therapeutics; Surgery, including applied anatomy, surgical pathology, and surgical specialties; Obstetrics and Gynecology; Public Health, including hygiene and medical jurisprudence. Part III, to consist of a practical examination in each of the following four subjects: Clinical Medicine, including medical pathology, applied physiology, clinical chemistry, clinical microscopy and dermatology; Clinical Surgery, including applied anatomy, surgical pathology, operative surgery, and the surgical specialties of the diseases of the eye, ear, nose, and throat; Obstetrics and Gynecology; Public Health, including sanitary bacteriology and the communicable diseases.

Parts I and II will be conducted as written examinations in Class A Medical Schools and Part III will be entirely practical and clinical. In order to facilitate the carrying out of Part III, subsidiary boards will be appointed in the following cities: Boston, New York, Philadelphia, Minneapolis, Iowa City, San Francisco, Denver, New Orleans, Baltimore, Galveston, Cleveland, St. Louis, Chicago, Washington, D. C., and Nashville, and these boards will function under the direction of the National Board. The fee of \$25 for the first part, \$25 for the second part and \$50 for the third part will be charged. In order to help the Board the Carnegie Foundation has appropriated \$100,000 over a period of five years.

At the Annual Meeting, held June 13 of this year in Boston, the following officers were elected: M. W. Ireland, Surgeon General, President; J. S. Rodman, M.D., Secretary-Treasurer; E. S. Elwood, Managing Director.

Mr. Elwood will personally visit all Class A Schools during the college year to further explain the examination, etc., to those interested. Further information may be had from the Secretary-Treasurer, Medical Arts Building, Philadelphia.

AMERICAN PUBLIC HEALTH ASSOCIATION

The American Public Health Association announces four phases of its semi-centennial celebrations to be held in New York City, November 8-18, 1921:

(a) *The Scientific Sessions* will be held November 14-18. There will be programs of the following sections. Laboratory, Vital Statistics, Public Health Administration, Sanitary Engineering, Industrial Hygiene, Food and Drugs. There will also be special programs on Child Hygiene and Health Education and Publicity.

(b) *Health Institute*, November 8-12. During the week preceding

the convention proper there will be organized demonstrations of the various types of public health activity in New York and environs: Health Department bureaus, laboratories, health centers, clinics, hospitals, etc.

The purpose will be to show health functions in actual operation, especially those which may be duplicated in other cities. In one sense the Health Institute may be considered as a school of instruction in practical health administration.

(c) *Dr. Stephen Smith*, the founder and first president of the Association, who is now in his 99th year, will be the guest of honor at a banquet to celebrate his approaching centennial and the semi-centennial of the Association.

(d) *A Historical Jubilee Volume*, "Fifty Years of Public Health," will be published about October 1. There will be articles by seventeen authors, relating to the accomplishments and present status of each of the important branches of public health. While concentrating upon the public health of the last fifty years, the book will describe the earlier beginnings of public health in an introductory way, and may, therefore, be considered a general history of public health from the earliest days to the present.

Detailed announcements, programs, and information concerning special railroad rates will appear in the *American Journal of Public Health* and the *News Letter* of the Association from time to time or may be had upon addressing the Association at 370 Seventh Avenue, New York City.



BOOK REVIEWS

SANITARY ENTOMOLOGY. The Entomology of Diseases, Hygiene and Sanitation Edited by William Dwight Pierce, Ph.D. Consulting Entomologist, formerly Entomologist Southern Field Crop Insect Investigations, United States Department of Agriculture. Boston. 1921. Richard G. Badger. The Gorham Press. Price \$10.

This work is a contribution of genuine value to the literature of sanitary science. It has been prepared by ten experts of high standing while the editor, Doctor Pierce, now a consulting entomologist, was for fifteen years connected with the Bureau of Entomology of the Department of Agriculture.

This volume presents the information needed by pathologists in the study of disease transmission; it approaches the control of insects from the standpoint of the sanitarian, the veterinarian, and even of the business man or private householder; it puts the information in the most convenient form for use.

No other work on entomology has dwelt on the prophylaxis, which is really the most important part of the subject. About one-third of the chapters are devoted to practical discussions of the control of disease-carrying insects, and these chapters are not compilations, but represent the personal experience of the best American authorities. The chapters on disease transmission are handled in a new manner. There is a chapter on each group of insects which carry or cause disease and the diseases are arranged in order according to the organisms which cause them. In this manner very important conclusions have been drawn, which settle problems which heretofore have remained unsolved.

The book also contains information concerning: disinfection of garments; drainage problems; disposal of garbage; excreta and manure; handling of hog pens, chicken yards and stable yards; packing house problems; and many household problems.

The illustrations are excellent and numerous.

FRANCIS M. MUNSON.

THE ASSESSMENT OF PHYSICAL FITNESS. By Correlation of Vital Capacity and Certain Measurements of the Body. By Georges Dreyer, C.B.E., M.A., M.D. Fellow of Lincoln College, Professor of Pathology in the University of Oxford, Corresponding Member of the Royal Danish Academy of Letters and Sciences. In Collaboration with George Fulford Hanson, Late Lieutenant U. S. A. Medical Corps, Air Service. With a Foreword by Charles H. Mayo, Rochester, Minn. Paul B. Hoeber. 67-69 East 59th Street, New York, City. 1921. Price, \$3.50 net.

This is a book that should command the attention of all physicians who are interested in industrial medicine, actuaries of insurance companies, public health nurses and settlement workers, for the reason that unlike most books on the same lines, the author contends that the occupation of the individual plays a large part in his physical dimensions.

In the past, insurance companies have had hard-and-fast rules as to what the physical dimensions should be to make the applicant acceptable irrespective of his occupation, and the same remark applies to all those investigators of physical fitness who have followed the matter with more or less interest. Doctor Dreyer divides all workers into three classes and shows the differences in the physical measurements between Class A and Class B.—Men who have undergone prolonged physical training, or have an occupation which leads to muscular development, and men of the professional and business classes. Class C contains those who lead an extremely sedentary life, which it can readily be understood makes for a greater degree of underdevelopment than would obtain among those of Class A or Class B. Hence the

new note in a book on physical fitness and one that is inclusive of matters which have been overlooked by some authors, and on account of their neglect have given a one-sided account of the matter.

To quote Doctor Mayo who wrote the Foreword: "The importance of the physical fitness of man has been partially appreciated in the estimate of prognosis by physicians in the examination of the sick and in the measurement of the lung capacity by examiners for insurance companies. Dr. George Dreyer has shown that the estimation of vital capacity is more than a mere test, that it indicates the tendency to health and resistance to disease, and that in the prognosis of life's duration it parallels very closely the results of a general examination."

That the theories advanced by Doctor Dreyer are sane cannot fail to be apparent at once to the physician who reads the book, and no doubt will not be long in attracting the attention of actuaries of our various insurance companies. What with the Public Health Service and settlement workers already following the precepts laid down in this book and the strides made in industrial medicine in apportioning physical fitness on scientific lines, it will behoove all insurance companies to take into consideration, not lightly but with seriousness, the moment of a thorough understanding of the variations in physical measurements as these obtain normally in the man who does hard physical work, the man who does light physical work and the man who leads a sedentary existence. Only in this way will insurance companies meet the problem in a just manner as to who should be accepted and who should be refused.

FRANCIS M. MUNSON.

MOUTH HYGIENE. A Text-book for Dental Hygienists. Compiled and edited by Alfred C. Fones, D.D.S., Bridgeport, Connecticut. Second edition, thoroughly revised. With 218 illustrations and 8 plates. Lea and Febiger. Philadelphia and New York. 1921. Price, \$5.00.

In view of the increasing and wholesome interest now being taken in oral hygiene and the recent organization of a number of schools for the education and training of dental hygienists, the appearance of the second edition of Dr. Fones' valuable text-book is most timely. He has not attempted to embrace in his work all the anatomy, physiology, bacteriology, hygiene, etc., required in the education of a dental hygienist, but has confined the subjects to those which directly pertain to dentistry. The book will be valuable to school nurses as well as to dental hygienists. The typographical work, illustrations and binding are excellent.

FRANCIS M. MUNSON.

NUTRITION AND CLINICAL DIETETICS. By Herbert S. Carter, M.A., M.D., Assistant Professor of Medicine, Columbia University; Associate Attending Physician, Presbyterian Hospital; Consulting Physician to the Lincoln Hospital, New York. Paul E. Howe, M.A., Ph.D. Associate in Animal Pathology, Rockefeller Institute for Medical Research; formerly Assistant Professor of Biological Chemistry, Columbia University, N. Y.; Nutrition Officer, Camp Kearny, California; Officer in charge of Laboratory of Nutrition, Army Medical School, Washington, D. C. Howard H. Mason A.B., M.D. Instructor in Diseases of Children, Columbia University, New York; Associate Attending Physician to the Presbyterian Hospital; Attending Physician to the Ruptured and Crippled Hospital, New York. Second Edition, thoroughly revised. Lea and Febiger. Philadelphia and New York. 1921. Price, \$7.50.

The second edition of this servicable book brings the subject up to date. All obsolete matter has been eliminated and the additions are largely in the form of amplifications. The chapters on Energy, Metabolism and Digestion have been

adequately revised and an entire revision of the chapter on Vitamines has been made. A new chapter has been added on Metabolism in Pregnancy and Lactation and the Feeding of Children over Two Years Old. Some additions, based on recent literature, have been made to the chapters dealing with the subject of Dietetics in Disease.

The work is useful to students, practitioners and sanitarians.

FRANCIS M. MUNSON.

THAT BOGEY MAN THE JEW. By G. Frank Lydston, M. D., Burton Publishing Co., Kansas City, Mo. Price, \$1.25.

With so many things worth while to be done, print paper at its present level, wages what they are, it seems to me rather tragically comic that Dr. Lydston should have wasted so much of himself and the material accessories in putting before the reading public a book, if indeed it may be so denominated, which it would have been infinitely better not to have printed. There are many of us who as individuals take exception to what appears in the public prints. We even protest under "Pro Bono Publico," "Old Subscriber," or otherwise; a practice so familiar with the *London Times* as to automatically associate this habit with that worthy sheet.

The Press may be wrong and, again, it may be right. That is readily conceded. But, after all, the Press is the expression of the people and if any unit of it wanders too far from the beaten path of right and equity it will almost inevitably be called back into line by the others who make up the journalistic whole. For an individual to launch into a flaming philippic and to put this into printed words and then sell it to the public strikes me as about as dignified, about as useful as were the efforts of the unbalanced old character who tilted against wind mills. I can see no more cause for Dr. Lydston to crucify everybody because he resents, personally, articles which have appeared in a certain newspaper and which he says were derogatory to the Jews, than for any one else to arrogate to himself the same privilege. I wonder what the Jews gain by his invective? I even wonder what he himself gains by it? The Jews are no mystery; they are a part and parcel of our citizenship. Everybody knows that there are good Jews and bad Jews. It changes in no manner a man's nature that he holds one religion or another.

Dr. Lydston is certainly far sweeping and catholic in the one hundred and thirty-six pages which (thank the Lord), limit what he has to say on his subject. On pages 11, 12, and 13 he wanders far afield to warn us all of the true mental attitude of some of our Allies. Just how germane to his subject this may be I cannot answer. On page 96 et seq. he plunges blithely into the question of our "Negro Problem," as he denominates it. I am a little puzzled to find the connection, if there be one, but I am reminded that there is somewhere a proverb which says something as to "where angels fear to tread."

As to the "book" itself, I find the style in which it is written execrable. It has neither logic nor sequence. The style is crude. The text is marred by colloquialisms which have no place in any serious work. It bristles with apt, or inapt, quotations; to such an extent that each page is speckled with the mark. Some of Dr. Lydston's damns are spelled out, while others are impaled on a long dash, a practice which, if I remember correctly, Dr. Johnson deplored on the ground that it did not hurt the oath nor help the swearer. The general tenor of the book suggests the excited output of a boy of eighteen, or to be charitable, possibly nineteen. We take it for granted that Dr. Lydston is sincere in what he says and that his intentions are good, but there is always the sad reflection that Hell is supposed to be paved with the same material.

The quality of paper used in the manufacture of the book is very good.

JAMES ROBB CHURCH.

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NOTES ON THE HISTORY OF MILITARY MEDICINE¹

By LIEUT. COLONEL FIELDING H. GARRISON

Medical Corps, United States Army

I. INTRODUCTORY

SINCE the time of Frölich,² it is commonly agreed to include under the term "military medicine" all that relates to military hygiene and sanitation, military surgery, medico-military administration, medico-military transport, recruiting, sanitary formations and training.

The history of military medicine has two main aspects, the professional or scientific and the administrative. Progress in military medicine, as a branch of medical science, has turned upon two principal coefficients—the advancement of scientific surgery and the advancement of the science of infectious diseases. Bacteriology has done more for this phase of the subject than anything else. The development of medico-military administration as a mechanism to assist in winning victories and to further the ends of medical science has turned upon a single factor, viz., the need of any nation for an organized standing army, however small, as a mechanism for its defense in time of need. In past history, the fate of all armies hastily levied, without forethought and preparedness, has been monotonously the same—faulty sanitation, tremendous mortality from communicable diseases, disastrous mortality from battle wounds. Except in well-organized armies, like the Roman or those of Frederick and Napoleon, never a sign of a sanitary formation, significant silence in the records as to organized care of the sick and wounded. In modern times, the need for some sort of military organization as a nucleus for the defense of a nation in time of war has been recognized by every modern state. Armies exist so long as war remains a biological phenomenon beyond the control of man, and even should the possibility of war be reduced to a minimum (on paper), small armies and navies will still be necessary to maintain the peace of the world.

¹ Expanded from two lectures delivered at The Medical Field Service School, Carlisle Barracks, Pa., June 21-22, 1921.

² H. Frölich: *Militärarzt*, Wien, 1874, xxiv, 45, 57, and the introduction to his *Militärmedizin*, Braunschweig, 1887, 1-4.

Wars are only a phase of the general phenomenon that life itself, in all its aspects, is conditioned by a conflict of elements, the nature of which we but dimly comprehend, beyond the well-known law of physics that forces always flow from higher to lower potentials. Wherever life manifests itself upon earth, there is a constant warring of diverse elements, without which there is apt to be decadence and stagnation. The painful evolution of man himself from his low prehistoric estate as an animal to his present civilized status was accomplished in just this wise. Not a single advance in our boasted civilization was made without conflict over contested ground. Physical chemistry teaches that life turns upon the surface energies of protoplasm. One of the greatest of modern physicists asserts that the struggle for existence of living matter is a war for free energy, and that when the free energy of a living organism (say a defenseless nation) becomes a minimum, its death is at hand.

In prehistoric or primitive society, man is a wild animal, with many degrees of freedom, compelled to do his own thinking and quick to defend himself. In civilization he becomes a tamed or domesticated animal, like a fireside cat or a potted plant, with little freedom, hardly any mechanisms of defense, his thinking usually done for him by others. Human history in the past has been largely made up of raids and wars of lawless, nomadic, barbaric elements upon settled, civilized, domesticated elements, and where the latter has been overcome it is because they have lost the power and means of defending themselves. Thus the pacifists and idealists of defenseless nations, are, in a sense, *participes criminis*, passive and pacific agents of their own dishonor, of the possible enslavement and degradation of their women and children or of other people's women and children. The French proverb runs: *Qui se fait brebis, le loup le mange*.

Beyond this statement of scientific fact, no explanation seems necessary for the existence of armies as such. The smallest nations, definitely organized as racial or social units, have never been without them in historic time, and for excellent reasons; if defenseless, they were sure to be invaded, subjugated, absorbed or partitioned through the intrigues of diplomacy and the "crimes of kings." The military status of Switzerland was adequate to maintain the autonomy of this small but sturdy state during the entire European War, while the valiant stand taken by Belgium recalls the ancient tribute of Julius Caesar: *fortissimi omnium horum Belgae*. But the European war has brought in its train a vast diminution of the productive power of civilized humanity, a demoralization and degradation of human dignity, which has embittered thousands of minds and hearts and, as usual in history, this bitterness is vented

not upon those who intrigued to make the war possible but upon the general theory of military establishments. It is characteristic of human nature and of the feebleness of the human mind that, in real life, the true villains in the play should always manage to rehabilitate themselves in the last act and so get the better of the poor *mens sibi conscia recti*.

The present feeling of the discharged civilian volunteer is expressed in the sentence of a living English novelist: "Everybody liked the war except those who had to fight it."³ The gigantic profiteering, the widespread decadence of morals, the enormous waste, as well as destruction of human life and material resources, the impoverishment of hundreds who cheerfully gave up their all to find their occupations gone upon discharge from service, have produced in the civilian population a fierce and very natural reaction against warfare in general and expensive armaments in particular.

While no individual battle of the World War was as destructive relatively as Thermopylae, or Cannae, or Gettysburg, or Custer's fight at Big Horn, the havoc wrought by high-power explosives and the employment of such offensive measures as gas attacks, air or submarine raids, which gave the victims no fighting chance, no power of motor resistance—all this has created a powerful world sentiment against the future possibility of wholesale slaughter of the defenseless, although the triviality of recent city life seems to "mock the riddled corpses round Bapaume." Military men, as well as statesmen, are therefore committed to the hope and belief that world sentiment and the future solidarity of mankind may perhaps avail to diminish (if not entirely prevent) the megalomania of warfare for conquest by great powers; but judging the future by the past, it is highly probable that small armies will always be necessary to execute the will of governments in maintaining world peace and as expansile nuclei for defense against invasion in time of need. Thus the organization, strength and efficiency of the German Army were admired everywhere, as long as that army was regarded as a bulwark of intranational stability, but the entire non-Germanic world turned against it when the great war itself was perceived to be a definite break-up of world-equilibrium, a special case of "inter-molecular wobble," which is said to have ruined the business even of caravans in the Far East.

The soldier, in relation to world warfare and the possibility of the invasion and conquest of his country, is thus, in a sense, an analogue of the doctor, in relation to major epidemics and the protection of his clientèle from communicable or fatal diseases. In time of peace the military man labors at humdrum duties, on relatively small pay, to

³ W. L. George: "Blind Alley."

assist his government in maintaining a stable social order; in time of war he is his government's principal agent and mainstay in elaborating proper mechanisms of defense against the enemy. In time of peace the medical officer is the family physician and sanitarian of his particular organization; in time of war he must devise ways and means to forestall and prevent epidemic diseases and to deal with the "traumatic epidemic" which Pirogoff declared war to be. The analogy drawn by Crookshank⁴ between the World War and the far most destructive epidemic of Spanish influenza (1918-19) seems true in all its parts. Both were biological phenomena, of remote, multiplex or undecipherable causation, arising suddenly, and nowise preventable by merely deciding or wishing that such things should not be; both were ultimately suppressed and ended by boldly going forth to meet them, *venienti occurrere morbo*, on the principle of Newton's third law of motion. Assuming, then, that world peace, a stable intranational equilibrium, is the "far off divine event to which the whole creation moves," the soldier and the doctor are really working toward the same end, the soldier to diminish the possibility of wars of magnitude by the maintenance of world peace, the physician to prevent the occurrence, recurrence and spread of communicable diseases by sanitation. On that great day, when wars and disease shall have become non-existent, both may, like Wotan, cheerfully will their own annihilation. To that millennium, Billings applied the ironical "Kannuri" proverb: "The day being finished, there is an end of medicine."

II. BIBLIOGRAPHICAL SOURCES

The existing literature of military medicine is of unusual extent, and at sundry intervals of time, medical officers of different nations have striven to take an account of stock by arranging this complex material in some orderly and logical sequence. This is the function of medical bibliography, by which is meant, not the minute description of books, like objects in natural history, for identification by the bibliophile, but the arrangement of book titles and indexed articles in such wise that the physician may gain from it a complete purview of the existing state of knowledge of the given subject at the time the bibliography was prepared. A thoroughgoing analytical bibliography of a medical subject is the key to its literary history up to the time of preparation or publication. Much may be done by this method, as a scaffolding for investigation or writing. Thus the bibliography of pediatrics by F. L. Meissner (1850) contains all the literature from 1472 to 1850, arranged by subject headings, and affords a complete picture of the historical development of the specialty to that date. The same thing applies to Lehr's

⁴F. G. Crookshank: *MILITARY SURGEON*, Wash., 1921, xlviii, 172-179.

remarkable calendar of psychiatry (1901), which gives the literature and events from 1459 to 1799, arranged in chronological order. In the Index Catalogue of the Surgeon General's Library, the historical literature of military medicine is arranged, by wars and campaigns, in alphabetical order. Now the basic literature of the history of military medicine is peculiar in that, prior to the end of the eighteenth century, its meager data are commonly buried in secular (non-medical) writings and the memoirs of great personages, for in this earlier period medical officers, as such, were non-existent, and military surgeons, when attached to armies, were virtually vassals and body physicians of kings and powerful nobles. After the eighteenth century, when the proper care of the sick and wounded soldier became a function of government, the basic (authentic) data are usually to be found in the military orders, circulars, statistical reports and other public or confidential documents of the military establishments of various nations. The approaches to the subject are therefore difficult, widely separated, and sometimes inaccessible. It is for this reason, as Straub once observed, that the history of military medicine, like the history of public hygiene, has remained largely unwritten.⁵ Excellent surveys are afforded in the histories of military surgery by Koehler (1901) and Cabanés (1918), but the subject has been otherwise investigated only in particular campaigns, histories of medical departments of armies and suchlike phases, and no consecutive and continuous history, based upon archivist research, has been prepared to date. In the present brief narrative, the writer can indulge no pretensions to the vast erudition and military experience required for the larger task, but on the assumption that a sketchy outline may at least stimulate others to further research, it is hoped that the bibliographical and similar data may be useful.

The earliest list of bibliographical titles on military medicine is that of Carl Philipp Diez, consisting of valuable footnotes to his graduating dissertation on the condition of the atmosphere and of food as matters of moment in military hygiene (1762).⁶

In the following year, Ernst Gottfried Baldinger (1738-1804), a Prussian army surgeon and medical historian, published, as an appendix to his dissertation on diseases of armies (1763), an extensive bibliography, which was separately printed as an enlarged second edition in 1764.⁷ This important pamphlet, the starting point of all subsequent

⁵ Outside the military profession, the subject has otherwise excited no interest, for the reasons above given. One of the greatest of modern medical historians, when approached on the matter, replied: "The subject is distasteful to me."

⁶ C. P. Diez: *De aere et alimentis militum praecipuis hygienis militaris momentis*, 4°. Tübingen, 1762.

⁷ E. G. Baldinger: *Introductio in notitiam scriptorum medicinae militaris*. 8°. Berlin, 1764. For a detailed account of this work see H. Frölich: *Deutsche Vrtljschr. of öffentl. Gsundtsppflg*, Braunschweig 1875, vii, 362-366.

bibliographies of military medicine, is arranged in seven sections, comprising 133 titles, most of which are provided with brief critical or explanatory notes by the compiler. As more than half of this work (the surgical part) had been irrecoverably lost by the Berlin printers, Baldinger frequently announced that he was working on a third edition, of which he published some fragments in 1791.⁸ But this project he never lived to complete. After his death in 1804, his fine library of 15,559 volumes was purchased by the Grand Duke of Hesse, to be absorbed by the Court Library at Darmstadt.⁹

Following the Baldinger publication, a number of other useful bibliographies appeared at intervals, viz.:

1845. IRVING (JAMES): *A Concise View of the Progress of Military Medical Literature in this Country*. James Irving (1822-98) was an Edinburgh medical graduate who entered the Indian Medical Service in 1847 and was the first surgeon general of the combined provinces of Bengal and Oressa (1878). His contribution of 82 pages gives concise analyses of all the important English books, from Gale's treatise on gunshot wounds (1563) to 1844, a period of nearly 300 years. His object, he admits, is to impress the young physician with the advantages of service in the British Army for "the study of practical medicine."
1862. ROSTER (VICTOR): *Essai d'un bibliographie universelle de la médecine et de la chirurgie militaire*. Contains 4,424 titles, mostly French, and includes everything listed by Baldinger.
1873. FRÖLICH (HERMANN): *Zur Bücherkunde der militair-medieinischen Wissenschaft*. Contains an interesting list of titles, arranged in chronological order, from 1497 to 1872. While many important items are lacking, this list is a good conspectus of the progress of military medicine in time, as judged by the texts. The rest of Frölich's work, which is of a more important order, is given below.
1876. FRANKEL (G. H. F.): *Bibliotheca medicinae militaris et navalis. Beiträge zur Literatur der Militair-und Schiffsheilkunde, Part I* (Glogau, 1876). Consists of titles of graduating dissertations and academic programs, arranged in alphabetical order, with a subject index at the end. No more published.
- 1880-1921. *Index Catalogue of the Library of the Surgeon General's Office, 1-3 series, 40 volumes*. Edited by the late Col. John S. Billings and the successive librarians of the S. G. O. Contains subject bibliographies of all branches of military medicine. As these contain, for the first time, the articles indexed in medical periodicals, they are of more practical use than the earlier lists, made up of books and pamphlets alone. The more important rubrics are *Armies*; *Army*; *Hygiene (Military)*; *Medicine (Military)*; *Surgery (Military)*, with subdivisions, e.g., *Medicine (Military, History of)* by *Campaigns*, *Sieges* and *Wars*. These can easily be found, in proper alphabetical sequence, in each of the three series, which cover literature as follows: 1st Series (16 volumes, A to Z) from earliest periods to 1895; 2d series (21 volumes), 1896-1916; 3d series (3 volumes so far published), 1918 to date.

⁸ Baldinger: *Neues Mag. f. Aerzte*. Leipzig, 1791, xiii, 458-462.

⁹ Frölich. *Militärmedizin*, 1887, 6.

1914. TICHY (FRANZ): *Militärärztliche Literatur in den Jahren 1750 bis 1850. Beitrag zur Geschichte der Medizin* (Deutsche mil.-ärztl. Ztschr., Berl., 1914, xliii, 609-618). An analysis of the medico-military literature of a century (1750-1850).

Perusal of any of the above are highly instructive, as indicating the kind of tasks and problems which occupied the minds of medical officers in the different historical periods. The reader may note, by simple inspection of the titles, the enormous literature of gunshot wounds and hospital gangrene, and the changes in point of view as to treatment; the speculations as to the nature of Hungarian camp (typhus) fever (*De lue pannonica*) during the sixteenth to eighteenth centuries; the extensive literature on Egyptian ophthalmia (trachoma) after the publication of Larrey's monograph (1802); on conservative amputation after Bilguer's essay (1761); on heat stroke, following the investigations of the Indian Medical Service; on malingering (*De morbis fictis*) and its detection from the earliest times; on moral support of the patient during amputation prior to the introduction of anesthesia; on the status of *débridement* from Larrey to Lemaître; on the social distress and bad hygienic status of the population following the Napoleonic Wars (*De damno et calamitate quae in sanitatem publicam et societatem ex perpetuo bello redundat*). Even a list of books shows that there is nothing new under the sun.

Much more important for historical investigation is the work of a number of scholars who first grappled with special segments of this difficult material and endeavored to get the inwardness of it and to draw conclusions from it. Upon the findings of these investigators, much of recent writing has been based. Early in the nineteenth century (1807-9) nine dissertations were published by various medical students at the University of Wittenberg on the set theme: "In what manner did the Romans render aid to wounded soldiers in battle?"¹⁰ This was a new departure, something quite different from merely listing the books and analyzing them *seriatim*, as Baldinger had done for the literature up to 1764, or Irving for the English literature between 1563 and 1844. As Latin students' dissertations go, this method was absolutely sterile and unproductive when applied to the live subject of military medicine itself, for the many Latin contributions of the seventeenth and eighteenth centuries were written, not from actual fresh experience in the field, but merely as summaries of the works of predecessors, with a musty flavor of the lamp, the inkhorn and the stuffy little room with porcelain stove.¹¹ But in establishing data for the *history* of our subject, it was

¹⁰ *Disceptataequestio: Quibus modis militibus in pugna vulneratis succurrerint Romani*³. *Commentationes i-ix.* 4°. Wittenberg, 1807-9. These are rare and not in the Surgeon General's Library.

¹¹ For a sound view of this "*Stubenwissenschaft*" see A. Dreyer: *Med. Ztg. Russlands*, St. Petersburg, 1855, xii, 196-198.

necessary that some such steps be taken. The most remarkable work in this line was done by Kühn and Frölich.

Kühn's Prolegomena

The French surgeon, Verneuil, once observed that "while erudition certainly creates nothing, it leads to creation. To discountenance research in literature (he goes on to say) is like advising travelers who visit regions not fully explored to refrain from making use of the maps prepared by their predecessors. The great objection to such work is the amount of time which it requires, if it is to be done thoroughly and accurately." The life work of Carl Gottlob Kühn (1754-1840) is exemplified in these lines. Professor of medicine at Leipzig for more than half a century (1785-1840), he was one of the greatest of medical scholars, an editor and commentator of all the older writings, from Hippocrates and Galen to Sydenham, Huxham and Baglivi. To him we owe the great bilingual of Galen in 20 volumes, which is still used in libraries along with Littré's bilingual of Hippocrates. During 1824-27, Kühn published eight academic programs (faultily numbered, he admits, as I-VI, X, XI) on the status of military medicine among the Greeks and the Romans.¹² These deal with (I) military medicine in the Trojan War (Homer), (II-III) in Xenophon, Polybius and Hyginus, (IV-V) in the Roman inscriptions of the Empire, (VI-VIII) in the legal codes of Augustus and the later emperors. Written in Latin, these studies are not readily accessible today, but Kühn's findings have fortunately been absorbed in the general body of knowledge. This is evidenced by the amount of literature on Greek and Roman military medicine which has followed his original presentation of the theme, e.g., Zimmermann (1834), Sir James Y. Simpson (1856), Briau (1866), Gaupp (1869). More extensive independent and original investigation has since been made, notably in the solid monographs of Daremberg (1865), and Frölich (1879) on medicine in Homer; but much in the way of borrowed plumage and pasted jewels of citation is elsewhere easily traceable to the elder writer.

Frölich's Prolegomena

A man of far different type was Franz Hermann Frölich (1839-1900), one of the surgeons general of the Saxon army (1893-1900). Frölich entered the military service before his graduation in medicine, served in three wars, and was a leading authority on his subject in his day. Beginning with his graduation dissertation (Leipzig, 1862),¹³ his writings,

¹² C. G. Kühn: *De medicinae militaris apud veteres Graecos Romanosque conditione*. Programmata I-VIII, 4^o, Leipzig, 1824-7.

¹³ This, a study of temperature relations in typhoid fever in troops, was prepared under the direction of Wunderlich, and published three years before the appearance of the latter's treatise on clinical thermometry (1869).

219 in number, are exclusively about military medicine, and his great treatise of 1887 was the first book in which the theme is treated by and large, in all its branches. His recommendations as to chest measurements in troops (1869) were officially adopted for the German army and navy ten years later (1879). He was a warm personal friend of Colonel Billings, librarian of the Surgeon General's Office, with whom his correspondence was extensive.

Frölich, a man of fine classical education, was the most prolific of all writers on the history of military medicine. His many contributions were undoubtedly so many preliminary studies to a complete book on the subject. The best of this material was, however, absorbed in his general treatise on "Militärmedizin" (1887), which begins with an extraordinary layout of the basic historical sources. The bibliographical sources for the military medicine of antiquity are accurately indicated, as to chapter and verse, from Homer and the Bible, through Livy, Caesar and the other Roman writers, up to the Dark Ages. The bibliography of the modern period is, however, poorly arranged and more difficult to follow. Frölich was, in fact, a careless bibliographer, but no one ever used this tool to better advantage. During his period of activity (1869-1901) he produced scores of books and articles dealing with every historical aspect of his subject, not all of equal merit, it is true, but unquestionably the best of their kind, and a source of inspiration to all future students. The literary style is somewhat diffuse but colorful, and the frequent handling of identical themes suggests that Frölich was working to perfect himself for a definitive summary of the whole subject. His amazing productivity is indicated in the following lists of titles:¹⁴

- 1869. J. A. à Geheema's book, "The well-equipped Field-Physician" (1684). Allg. mil.-ärztl. Ztg., Wien, 1869, 195; 204.
- 1872. Celsus on the operative treatment of wounds from projectiles. Deutsche mil.-ärztl. Ztschr., Berl., 1871, I, 525-535.
- 1873. On the bibliography of military medicine. 50 pp. 8°. Berlin, 1874. Supplement to; Deutsche mil.-ärztl. Ztschr., Berl., 1873-4, II=III.
Contributions to the history of military medicine. Allg. mil.-ärztl. Ztg., Wien, 1873, XIV, 4; 20; 28; 37; 41.
- Hieronymus Braunschweig on gunshot wounds (end of the fifteenth century). Militärarzt, Wien, 1873, VII, 110-120.
- The outposts of medico-military literature, Militärarzt, Wien, 1873, VII, 17-20.
- 1874. On the content of military medicine. Militärarzt, Wien, 1874, XXIV, 45; 57.

¹⁴ This list has been prepared and verified from the somewhat faulty bibliography of his collective writings (1869-83), made by Frölich himself in Wien. med. Presse, 1884, xxiv, 999; 1061; 1089, and the completion of the same (1884-1901) in the obituary notice by Helbig in Reichs-Med.-Anzeiger, Leipz. 1900, xxv, 471-472.

- 1874 On a discovery relating to the military surgery of the Middle Ages. *Deutsche mil.-ärztl. Ztschr.*, Berl., 1874, III, 583-594.
 On the history of military medicine in England. *Militärarzt*, Wien, 1874, XXIV, 169; 179; 185; 195; 1875, XXV, 3; 11; 19; 51.
 History of the Regulations of the Medical Department of the German Army. *Vrtljschr. f. gerichtl. u. öffentl. Med.*, Berl., 1874, XXI, 100-128.
1875. On the earliest bibliography of military medicine. *Deutsche Vrtljschr. f. öffentl. Gsundhspflg.*, Brunschwg., 1875, VII, 362-366.
 Guide to the investigation of the history of military medicine in antiquity. *Militärarzt*, Wien, 1875, XXV, 177; 178.
1876. The helmets of Homer's heroes. *Arch. f. path. Anat.*, Berl., 1876, LXVIII, 381-398.
 The oldest known case of malingering. *Feldarzt*, Wien, 1876, XXI, 61; 65.
 Thoughts on the prehistoric origin and later developments of aid to the sick and wounded in war. *Feldarzt*, Wien, 1876, XXI, 81; 101.
1877. Barracks in the Trojan War. *Arch. f. path. Anat.*, Berl., 1876, LXXI, 509-514.
 Catalogue of the Library of the Medical Department of the Saxon Army. 138 pp. 8°. Dresden, 1877.
 Medical features of the Turco-Serbian campaign of 1876. *Deutsche mil.-ärztl. Ztschr.*, Berlin, 1877, VI, 110; 168; 205.
 The Saxon Army Medical School. *Feldarzt*, Wien, 1877, 49; 53.
- 1877-8. Periodical literature of 1870-76 on the medical history of the Franco-Prussian War. *Feldarzt*, Wien, 1877, 61; 65; 69; 78; 98; 1878, 2; 14.
- 1877-82 Status of military medicine during the years 1877-82. *Jahrb. f. prakt. Med.*, Berlin, 1877-82, *passim*.
- 1878 Ancient Oriental military medicine. *Deutsches Arch. f. Gesch. d. Med.*, Leipz., 1878, I, 27-42.
 The chiton of Homer's heroes from a sanitary viewpoint. *Arch. f. path. Anat.*, Berl., 1878, LXXIII, 625-628.
 Contribution to the medical history of the Franco-Prussian War. *Militärarzt*, Wien, 1878, XII, 185; 193; 201; 211; 217.
 Report on military medicine at the Paris Exposition of 1878. *Deutsche med. Wochenschr.*, Berl. 1878, IV, 495; 507; 522.
1879. Bibliography of recruiting. *Schmidt's Jahrb.*, Leipz., 1879, CLXXXI, 201-206.
 History of the Medical Regulations of the Saxon Army. *Wissensch. Ber. d. k. sächs Sanitätsdienst*, Dresd., 1879, 25-62.
 The military medicine of ancient Greece in the post-Homeric period. *Deutsches Arch. f. Gesch. d. Med.*, Leipz., 1879, II, 395-404.
 Military medicine in Homer. 65 pp. 8°. Stuttgart, 1879.
 On the military surgery of the 17th Century. *Deutsches Arch. f. Gesch. d. Med.*, Leipz., 1879, II, 142-144.
- 1880 The antiquity of gunshot wounds. *Wien. med. Presse*, 1880, XXI, 218-220.
 Historical data on the military medicine of the Germans in antiquity and the Middle Ages. *Deutsches Arch. f. Gesch. d. Med.*, Leipz., 1880, III, 222-256.
 Paul of Ægina as a military surgeon. *Wien. med. Wochenschr.*, 1880, XXX, 1241; 1265.
 On the basic periodical literature of military medicine. *Schmidt's Jahrb.*, Leipz., 1880, CLXXXVI, 84-87.

- On the war surgery of the ancient Romans. *Arch. f. klin. Chir.*, Berl., 1880, XXV, 285-321.
1881. Historical aspects of recruiting from the viewpoint of military medicine. *Mil. Wochenbl.*, Berl., 1881, No. 79.
1882. On the beginnings of military medicine in The Middle Ages. *Deutsches Arch. f. Gesch. d. Med.*, Leipz., 1882, V, 75-80.
Some of the oldest essays on gunshot wounds. *Arch. f. klin. Chir.*, Berl., 1881-2, XXVII, 593-613.
Notes on sanitation in the Egyptian campaign. *Wien. med. Presse*, 1882, XXIII, 1624; 1651.
War-surgery a thousand years ago. *Arch. f. klin. Chir.*, Berl., 1882 3, XXVIII, 862-866.
1883. The literary sources for the military medicine of antiquity and the Middle Ages. *Wien. med. Presse*, 1883, XXIV, 938; 1069.
1884. Albucasis on war-surgery. *Arch. f. klin. Chir.*, Berl., 1884, XXX, 364-376.
Contribution to the literature of instruction in military medicine. *Militärarzt*, Wien, 1884, XVIII, 107; 115.
On the oldest Austrian periodical of military medicine. *Militärarzt*, Wien, 1884, XVIII, 102.
On the ophthalmologist, G. J. Beer. *Wien. med. Wochenschr.*, Berl., 1884, XXXIV, 1503-1505.
The periodical literature of military medicine. *Militärarzt*, Wien, 1884, XVIII, 67-70.
War surgery in Avicenna. *Arch. f. klin. Chir.*, Berl., 1884, XXX, 745-752.
1885. The beginnings of military hygiene in the Middle Ages. *Deutsche Vrtljschr. f. öffentl. Gsundtsplg.*, Braunschg., 1885, XVII, 433-436, *Also*: *Militärarzt*, Wien, 1887, XXI, 9-12.
Cultural history of the aims of instruction in military medicine. *Neue mil. Bl.*, 1885, Hft. 1.
Origin of military medicine. *Militärarzt*, Wien, 1885, XIX, 81; 89.
1886. War-wounds in the Middle Ages and their treatment. *Oesterr. mil. Ztschr.*, Wien, 1885, 50.
1887. The beginnings of military hygiene in antiquity and the Middle Ages. *Militärarzt*, Wien, 1887, XXI, 9-12.
Bibliography and literary sources of the history of military medicine. *In his: Militärmedizin*, Braunschweig, 1887, 5-35.
1888. History of the Medical Corps of the Saxon Army. 148 pp. 8°. Leipzig, 1888.
Losses in war. *Oesterr. mil. Ztschr.*, Wien, 1888, 90-109.
The oldest medical regulations of the German Army. *München med. Wochenschr.*, München, 1888, XXXV, 910.
1889. Battle-losses in antiquity. *Allg., mil. ärztl. Ztg.*, Wien, 1889, No. 91.
Galen on malingering. *Friedreich's Bl. f. gerichtl. Med.*, Nürnberg, 1889, XI, 21-26.
1890. The earliest cases of gunshot wounds. *Prag. med. Wochenschr.*, 1890, XV, 197.
Medico-military libraries. *Militärarzt*, Wien, 1890, XXIV, 9; 17; 28; 35.
Organization of the Medical Department of the U. S. Army. *Militärarzt*, Wien, 1890, XXIV, 105; 113.
1891. The health of Napoleon I during the Russian campaign of 1812. *Militärarzt*, Wien, 1891, XXV, 65-68.

- Recruiting in the United States Army. *Militärarzt*, Wien, 1891, Nos. 18-19.
 The military medicine of ancient Carthage. *Militärarzt*, Wien, 1892, XXVI, 17-20.
1893. Examinations for admission to the Medical Corps, U. S. Army. *Militärarzt*, Wien, 1893, XXVII, 49-52.
1895. The development of recruiting service; past and future, *Wien. klin. Wochenschr.*, 1895, VIII, 757-760.
 Did the armies of ancient Egypt have an organized medical service? *Wien. klin. Wochenschr.*, 1895, VIII, 924.
 The medical personnel of the British Army. *Samariter*, München, 1895, I, No. 23-24.
 Recruiting of armies in old times, *Leipz. Tagebl.*, Sept. 5.
 Voluntary nursing in the wars of antiquity. *Ztschr. f. Krankenpflg.*, Berl., 1895, XVII, 55-58. Also *Wien. klin. Wochenschr.*, 1895, VIII, 9.
1896. Comparison of the military hygiene of the Homeric period with that of today. *Vrtljschr. f. öffentl. Gsundtspflg.*, Prag, 1896, Hft. 1.
 Losses in war. *Ztschr. f. Krankenpflg.*, Berl., 1896, XVIII, 41; 66; 89; 116; 140; 163; 185; 211.
 Medical personnel of the Russian Army. *Samariter*, München, 1896, I, Nos. 8 et seq.
 Mortality and morbidity in the larger European armies in the time of peace. *Mil. Rundsch.*, 1896, Hft. 3.
 Nursing at the battle of Leipzig. *Leipz. Tagebl.*, 1897, March 9-18.
 Precursors in charitable nursing. *Reichs. Med. Anz.*, Leipz., 1898, XXIII, 161-164.
1897. Cremation in the Homeric poems. *Janus*, Amst., 1897-8, II, 248-251.
 When did the first gunshot wounds occur? *Heilkunde*, Wien, 1896-7, I, 502-505.
1898. Military hygiene in the American and Spanish Armies. *Centralbl. f. allg. Gsundtspflg.*, Bonn, 1898, XVII.
 Schiller's early experience as an army surgeon. *Wien. med. Wochenschr.*, 1898, XLVIII, 1027; 1090; 1131.
1899. On a charitable aid from the animal kingdom. [History of the use of dogs in rescue of the wounded.] *Wien. med. Wochenschr.*, 1899, XLIX, 2251; 2291.
1900. Medical service of the British Army. *Centralbl. f. allg. Gsundtspflg.*, Bonn, 1900, XIX, 19-33.
1901. Military medicine in the 16th century. *Janus*, Harlem, 1901, VI, 68; 123; 178; 253; 309; 366.

It is clear from the above layout that Frölich was assembling materials for a book up to the year of his death; but, given the insufficient knowledge of his time, he sometimes committed himself to glittering generalities, and his conclusion that Homer was himself a military physician did not win the acceptance of the German classical scholars.

Beginnings of Exact Documentation

Meanwhile, during the second half of the nineteenth century, individual books of a more exact and precisely documented kind had begun to

appear, e.g., the histories of the medical establishment of the Prussian Army by A. L. Richter (1860)¹⁵ and C. J. Prager (1864-5),¹⁶ and the massive history of the development and status of military medicine in European countries by Emil Knorr (1880),¹⁷ a major of the Prussian General Staff. These works, bristling with dates, statistics and footnote references to the literature and the official publications of governments, afford early instances of the kind of elaborate documentation now required in military history. To this *genre* Frölich himself contributed one admirable example, viz., his history of the medical department of the Saxon Army (1888), which is based upon state documents.

Myrdacz

In 1898, Paul Myrdacz, a staff surgeon in the Austro-Hungarian Army, published a huge volume containing separate histories of the existing medical establishments of Austro-Hungary, Germany, Italy, Russia, and France, with medical histories of the Crimean War (1854-6), the Italian Campaign of 1859, the Danish and Austro-Prussian Wars of 1864 and 1866, the Franco-Prussian War (1870-71) and the Russo-Turkish War (1877-8).¹⁸ This is a reference book of great value, particularly as to medical statistics of the principal European wars of the nineteenth century. It contains a chronological table of the principal events in the development of the medical department of the Austro-Hungarian Army, by S. Kirchenberger, which is again based upon government documents.

Koehler

In 1899, Albert Koehler, a Prussian staff surgeon, published, under the auspices of the Kriegsministerium, an elaborate series of biographies of German military surgeons and medical officers of the seventeenth and eighteenth centuries, which was further extended, to cover the first half of the nineteenth century, by staff surgeons Bock and Hasenknopf (1901).¹⁹ These studies were the basic material for Koehler's short illustrated book, "Essentials of the History of Military Surgery" (1901),²⁰ which, as including an outline of the history of military medicine, is the handiest manual yet published. The treatment is concise and attractive, and, while exception may be taken to the excess of

¹⁵ A. L. Richter: Geschichte des Medicinalwesens der Königl. Preussischen Armee, 8°. Erlangen, 1860.

¹⁶ C. J. Prager: Das preussische Militär. Medicinalwesen, 8°. Berlin, 1864, 2. Aufl. 8°. Berlin, 1875.

¹⁷ E. Knorr: Entwicklung und Gestaltung des Heeres-Sanitätswesens der europäischen Staaten, 3°. Hannover, 1880.

¹⁸ P. Myrdacz: Handbuch für k. und k. Militärärzte, roy. 8°, Wien, 1898, II.

¹⁹ A. Koehler et al: Veröffentlich. u. d. Geb. d. Mil.-San.-Wesens, Berl., Heft 13, 1899 Heft 18, 1901.

²⁰ Koehler: Grundriss einer Geschichte der Kriegschirurgie (Bibliothek von Coler, vol. 7) 80. Berlin, 1901.

Germanic data, the work is otherwise very reliable. The preponderance of German writings on our subject is easily explained by the essentially military character of the German and Austrian empires up to the European war. In 1855, Dreyer made a statistical study of 831 books on military medicine, and of these, 369 (48 per cent) were German, 187 English, 163 French and 54 Russian.²¹ In Germany even medical students and theologians have sometimes been moved to investigate the history of military medicine, and, as we have seen, the bulkiest and most elaborate contribution up to 1880 was made by an officer of the Prussian General Staff.

Cabanés

In 1918, Dr. Augustin Cabanés published a most interesting and valuable book, entitled *Chirurgiens et blessés à travers l'histoire* (Paris, 1918). As editor of the *Chronique médicale*, Cabanés had been hitherto the collector and amusing *raconteur* of the medical anecdotes and "in-discretions" of history, but in this large and well-illustrated book he appears as a very capable historian, carefully documenting his material everywhere and maintaining a just balance between French, English, German and other sources. The work is really an elaborate history of military medicine, attractive by its easy communicative style, its unique illustrations (225 in number) and the intelligent use which the genial author has made of the documentary material. Of special interest are the facsimile reproductions of French public documents of the Napoleonic period, e.g., the earliest printed commissions of medical officers, admissions to hospital, certificates of discharge, etc.

Miscellaneous Contributions from Continental Europe

On the continent of Europe, where nations and races of the most disparate type are contiguous and the possibility of war has been always imminent, the subject of military medicine and its history has been more closely studied than in detached, isolated countries like Great Britain or the United States. Apart from the larger works above mentioned, there is a considerable amount of pamphlet and periodical literature, the titles of which will be found in the Index Catalogue (1-3 series) and in the manuscript files of the Surgeon General's Library under the headings already given. Brief mention may be made of such outstanding historical studies as those of Billroth on the treatment of gunshot wounds (1859) and of railway transportation of the wounded (1874), of Gurlt on international nursing in wartime (1873), and on 150 years of military medicine in Prussia (1875), of Virchow on the progress of military medicine (1874), and the valuable essays of René Briau

²¹ Dreyer: *op. cit.*

(1866) Auguste Corlieu (1892) and Andrea Corsini (1916). Sudhoff's Catalogue of the Historical Section of the Dresden Hygienic Exhibition (1911) and his learned and spirited study of care of the wounded through the ages (1917) are of basic importance. Meyer-Steinerg's admirable essay on Greek and Roman hospitals (1912) contains descriptions and very understandable plans of the Roman military hospitals at Carnuntum and Novaesium.²²

English Sources

The "Notes towards the History of the Medical Staff of the English Army prior to the Accession of the Tudors" (1873) by Sir W. R. E. Smart, R.N., were translated by Frölich, liberally utilized by Knorr, and followed in the historical sketch of A. A. Gore (1879).²³ A good account of the later history of the Army Medical Staff is that of P. A. Young (1898).²⁴ Sir Thomas Longmore's treatise on the transport of the sick and wounded (1868) is rich in historical details, and his study of the medical conduct of the Crimean War (1883) is the best critical summary of the subject. Other valuable contributions are the short history of English military surgery by J. Young (1913),²⁵ H. A. L. Howell on care of the sick and wounded during 1715-48 (1914),²⁶ and Sir Anthony Bowlby's résumé of British military surgery from Hunter to the European War (1919).²⁷ The study of the Mongol Invasions (1909)²⁸ by Col. T. H. Hendley, Indian Medical Service is unique of its kind. The "Medical History" of E. T. Withington (London, 1894) contains three valuable chapters (pp. 74; 115; 221) based upon original research in non-medical writings.

American Contributions

These relate mainly to the history of the Medical Department of the United States Army, including the medical histories of the different wars which have been imposed upon our government. Worthily of especial note are:

BROWN (HARVEY E.): The Medical Department of the United States Army from 1775 to 1873. 8°. Washington, 1873.

BARBER (JOHN W.): Legislative History of the Subsistence Department of the U. S. Army, 1775-1876. 8°. Washington, 1876.

HAMELSLEY (T. H. S.): Complete Regular Army Register (1779-1879) 8°. Washington, 1880, 351-379.

INGERSOL (L. D.): History of the War Department. 8°. Washington, 1880, 210-258.

²² Th. Meyer-Steinerg: *Jena. med.-histor. Beitr.*, 1912, Heft 3, 34-45.

²³ A. A. Gore: *The Story of our Services under the Crown*. 8°. London, 1879.

²⁴ P. A. Young: *Edinb. M. J.*, 1898, n. s., iv, 11-20.

²⁵ J. Young: *J. Roy Army Med. Corps*, Lond., 1913, xvi, 134-189.

²⁶ H. A. L. Howell: *Ibid.*, 1914, xxii, 320; 455.

²⁷ Sir A. Bowlby: *Brit. M. J.*, Lond., 1919, I, 205-212, or: *Lancet*, Lond., 1919, I, 285-290.

²⁸ T. H. Hendley: *Brit. M. J.*, 1909, II, 374-377.

- HOFF (JOHN VAN R.): *Résumé of the history of the Medical Department, U. S. Army, 1775-1899.* J. Ass. Mil. Surg. U. S., Carlisle, Pa., 1901-02, x, 347-398.
- THIAN (RAPHAEL P.): *Legislative History of the General Staff (U. S. A.) 1775-1901.* 8°, Washington, 1901, 362-439.
- KEAN (J. R.): *The Army Medical Department.* J. Am. M. Ass., Chicago, 1904, xlii, 1216; 1287; 1352; 1418; 1491. [Reprinted.]
- OWEN (WILLIAM O.): *The legislative and administrative history of the Medical Department, U. S. Army, during the Revolutionary War (1776-1786).* Ann. Med. History, N. Y., 1917-18, I, 198; 261; 342. [Reprinted.]
- Chronological arrangement of Congressional legislation, 1785-1917. 12°. Chicago, 1918.
- DUNCAN (LOUIS C.): *The Medical Department of the U. S. Army in The Civil War.*

The reports of Col. John S. Billings on military medicine in Europe (1882) and of Brig. Gen. Alfred A. Woodhull on the Medical Department of the British Army (1894) are valuable. On the whole, the best piece of original research is that of Col. Charles L. Heizmann on military sanitation in the sixteenth, seventeenth and eighteenth centuries (1893; reprinted 1917)²⁹; which, like the chapters in Withington's History, is based upon data from secular writings and the personal memoirs of great commanders. An accurate, compact, and readable summary of the history of military medicine is that of Col. Weston P. Chamberlain, M.C. (1917, reprinted 1919).³⁰

Histories of Medical Departments of Armies

For those not already mentioned, consult the Surgeon General's Catalogue, first, second and third series, *sub voce* "Army" (and subdivisions).

Medical Histories of Campaigns and Wars

These are of two kinds, viz., personal memoirs and historical narratives by prominent medical officers, usually based upon recollection; and the official histories authorized and published by governments which, in the best examples, are based upon documentation. Examples of the first species are the "Apology and Treatise" of Ambroise Paré (1585), Thacher's "Military Journal" of the War of the Revolution (1827), the military memoirs of the elder Larrey (1812) on the Napoleonic Wars, of Mann (1816) on the war of 1812, of Chenu (1865) and von Hüblbenet (1871) on the Crimean War, of Chenu on the Italian and Franco-Prussian Campaigns (1869; 1874), of Pirogoff on the Crimean, Franco-Prussian and Tureco-Serbian Wars (1859-79), and such books

²⁹ 8°. Washington, 1914.

³⁰ C. L. Heizmann: J. Mil. Serv. Inst. U. S. Governor's Island, N. Y. H., 1893, xiv, 709-738. Reprinted in: Ann. Med. History, N. Y., 1917-18, I, 231-300.

³¹ W. P. Chamberlain: Boston M. & S. J., 1917, clxxvi, 479-486. Reprinted in: Smithsonian. Inst. Rep. 1918, Wash., 1919, 235-249.

as Lettermann's *Medical Recollections of the Army of the Potomac* (1866) and the *Personal Memoirs of John H. Brinton* (1914). Accurate and painstaking research is evidenced in such studies as those of Friedrich Loeffler on the Danish and Austro-Prussian Campaigns (1864-7; 1868) and of Emil Knorr on the Turco-Servian War (1883), which were prepared under government auspices, and also in the monographs on the Revolutionary, Mexican and Civil Wars by Col. Louis C. Duncan (1914-21), and the above mentioned histories of continental European wars by Paul Myrdaez.

As applied to the formal and official "medical histories" of wars issued by governments, the term "history" is usually a misnomer, since all the larger public documents of this kind are, in the main, made up of compilations of medico-military statistics, analyses of medical and surgical cases, studies of communicable diseases and other professional matters. This is largely true of the official medical histories of the Crimean, Civil, Franco-Prussian and Pan-European Wars. The great *Medical and Surgical History of the Civil War*, prepared by Woodward, Otis, Huntington and Smart (1870-88), does contain, however, valuable histories of the development of hospital construction, transport and surgical instrumentation, and a remarkable series of personal reports on battles and military operations by individual medical officers, which have been found very useful, even by the secular historians of this war. Up to the European war this latter collection has been unique, for, as we have seen, such battle reports have usually been elsewhere published as individual contributions by the medical officers themselves. Inasmuch as such reports have commonly been written in the past from the pocket diaries and note-books kept by medical officers in campaign, the necessity for careful documentation has latterly arisen, and for the following reasons. "Memory is a sieve," fallible as the human mind itself, and our psychologists have shown, to their own satisfaction at least, that few persons can describe an exciting event exactly as it occurred. Exact or even approximate dates of occurrences are particularly apt to slip their cables, whence careful heads of families were accustomed, in old times, to keep definite records of births, christenings, marriages, deaths and so forth, in the family Bible or private diary.

Newton is said to have forgotten some of his own mathematical discoveries, although he could always, on occasion, give the successive steps which led up to them; Sir Walter Scott is said to have wept on hearing one of his own songs, the authorship of which he had forgotten; and Clerk Maxwell, one of the keenest minds the world has ever known, made some very faulty computations in the kinetic theory of gases, through lapse of memory, at a time when his brain was tired out by

illness and approaching death. Physicians who only remember the approximate dates of articles they have written, or that someone else has written, are constant clients of medical librarians. Separate military reports of the same occurrence by different observers have been found to cross cables as to dates, statistics and close renditions of fact, and some of them have been shot through and through as to reliability when subjected to careful analysis. Documentation from the records, such as is now required by the General Staff for the administrative and non-professional portions of our medical history of the European War is therefore not "a Gaulish and a German thing" but something conditioned by the necessity of bringing history up to scientific standards of accuracy by holding the writer accountable and responsible for his statements. The reason for its existence is contained in the fine distinction made between culture and science by our greatest classical scholar: "Culture is the substance of things which a gentleman has forgotten."

Of actual or prospective medical histories of the European War, three volumes of the German have been published to date and are confined to purely professional and scientific material. As indicated by the prospectus, battle operations and administrative mechanism will not be a feature of this history. The preliminary pamphlets and volumes issued by the Medical Research Committee (National Health Insurance) suggest that the English history will be in the same trend. The medical history of American participation, now very properly entitled "The Medical Department of the United States Army in the European War," will deal with administrative and tactical, as well as professional, material. Under the editorship of Col. Charles Lynch, M. C., two volumes of this history are already in the press.

Lives of Eminent Military Surgeons and Medical Officers

The biographies of Ambroise Paré by Malgaigne (1840), Le Paulmier (1884) and Stephen Paget (1897) are all of extraordinary merit. The recent "Life and Times" by Dr. Francis R. Packard (New York, 1921) contains an excellent translation of Paré's *Apology and Journeys*, interesting for their grim pictures of war as it was in the sixteenth century. M. Roth's *Vesalius* (Berlin, 1892) is perhaps the most wonderful of all medical biographies; the illustrated volume by Dr. J. M. Ball (St. Louis, 1910) is excellent and reliable for those who do not read German. The best life of John Hunter is that by Stephen Paget (*Masters of Medicine*, London, 1897), and the same may be said of Paul Triaire's fine book about Larrey (Tours, 1902), of whom the best account in English is unquestionably that of Dr. J. C. Da Costa (1906).²¹ The

²¹ J. C. Da Costa: *Johns Hopkins Hosp. Bull.*, Balt., 1906, xvii, 195-215.

Prussian surgeons general and other German officers have been well taken care of in the collection of Koehler. The three-volume life of Helmholtz by L. Koenigsberger (Braunschweig, 1902) has been Englished by F. A. Welby (Oxford, 1906). Of Anglo-Indian officers, Sir Joseph Fayrer's *Recollections* (Edinburgh, 1900) is interesting for its details about the Mutiny; his life of Sir James Ranald Martin (London, 1897) and the sketches in the *History of the Indian Medical Service* by Lieut. Col. D. G. Crawford (Calcutta, 1914) are also to be recommended. Of American references, the biographies of John Morgan by M. I. Wilbert (1904), of William Beaumont by Jesse S. Myer (1912), of Letterman by Lieut. Col. B. A. Clements (1883),³² of Walter Reed by Howard A. Kelly (2d ed., 1913), and of George M. Sternberg by Mrs. Sternberg (1920) need only be mentioned. "The Surgeon Generals of the Army" by Major James E. Pilcher (1905), is a standard source of reference. The "Personal Recollections" of Eunice Tripler (privately printed, 1910) is, like the Sternberg biography, a pleasant record of army life by the widow of a celebrated medical officer.

Exhibitions of Military Medicine

Exhibitions of military medicine have been a feature of all international expositions, from the time of the Paris Exposition (1867) and its successors (1878, 1889, 1900) to the Centennial (1876) and the local American expositions at Chicago (1893), Buffalo (1901) and St. Louis (1904). A report on the English exhibit of military medicine at the Paris Exposition of 1867 was rendered by Sir Thomas Longmore. The exhibit illustrating the history of military medicine at the International Hygienic Exposition at Dresden, in 1911, was a new departure. Here the subject was illustrated from the Assyro-Babylonian period to the middle of the nineteenth century by inscriptions, placards, pictures, books and objects of all kinds.

During the World War no less than six historical exhibitions of this kind were held, in Berlin, London, Paris and Washington. The first of these was held in the parliamentary buildings at Berlin in 1914 and followed the Dresden exposition in the tendency of its historical exhibit. In the following year (1915), Dr. Norman Moore exhibited a number of old English texts of military medicine and surgery before the Medical Society of London and a similar demonstration was made to the Royal Medical Society (Historical Section) in the same year. In 1916 an exhibit of pathological specimens from the war was attached to the Historical Museum of the Service de Santé at Val de Grâce, and a similar exhibition by the Royal Army Medical Corps was opened at

³² B. A. Clements: *J. Mil. Serv. Inst.*, Governor's Island, N. Y. II., 1883, iv, 250-207.

the Museum of the Royal College of Surgeons, London, on October 11, 1917. In 1918, an exhibit of books and curiosities of the war was made in the Hall of the Surgeon General's Library under the direction of Col. C. C. McCulloch, Librarian, S. G. O.³³

Medico-Military Periodicals

The titles of the earliest periodicals devoted to military medicine are subjoined in chronological order of appearance in the different countries:

- 1782 France: *Journal de médecine militaire*. Publié par ordre du roi, v. 1-7. Paris, 1782-8.
- 1789. Austria: *Bibliothek der neuesten medizinisch-chirurgischen Literatur für die k. k. Feldchirurgen.*, v. 1-4. Wien, 1789-92.
- 1816. Germany: *Magazin für die gesammte Heilkunde, mit besonderer Rücksicht auf das Militair-Sanitäts-Wesen im königlich-preussischen Staat.* v. 1-24, n.F., v. 1-42. Berlin, 1816-48.
- 1823 Russia: *Voyenno-meditsinskii Journal* [Medico-military Journal] v. 1-240. Petrograd, 1823-1914. [Current at outbreak of European War.]
- 1848 Belgium: *Archives médicales belges. Organe du Corps sanitaire de l'Armée*, Bruxelles, 1848-1921.
- 1853. Italy: *Giornale di medicina militare*, v. 1-32, Firenze, Roma, 1853-84. [continued as: *Giornale medico del Regio Esercito*, Roma, 1885-1921].
- 1864 Spain: *Revista de sanidad militar española y extranjera*, v. 1-4. Madrid, 1864-7.
- 1876 Sweden: *Tidskrift i militär Hälsovård*. Stockholm, 1876-1921.
- Portugal: *Gazeta dos hospitaes militares*, v. 1-8. Lisbon, 1876-84.
- 1877. Holland: *Nederlandsch Militair-geneeskundig Archief*. [Various places], 1877-1921.
- 1891. United States: *Transactions* [Journal] of the Association of Military Surgeons, 1891-1906. Continued as: *Military Surgeon*, Washington, 1907-21.
- 1903 Great Britain: *Journal of the Royal Army Medical Corps*, v. 1-25. London, 1903-21.

Medico-Military Libraries

In 1781 the military hospital at Gumpendorf, Austria, was turned into a hospital school for field surgeons, and provided with a medical library during 1783-5. The Prussian *Pepinière*, for instruction of medical officers (founded 1795), was furnished with a medical library by Surgeon General Goercke in 1798. The Medico-Military Academy at Petrograd (founded 1798) acquired a medical library which was, for a long time, the largest medico-military library in the world (180,000 volumes, with 257 periodicals, and an annual budget of 600 rubles). This collection, once the second medical library of the world, has latterly been out-paced in number of volumes by the Surgeon General's Library. The Library of the Medico-Chirurgical Academy at Dresden (founded 1815)

³³ A full account of these exhibitions is given in *MILITARY SURGEON*, Wash., 1918, *alii*, 351-359.

was absorbed by the National Medical Collegium of Saxony in 1864, when the Saxon Army Medical School ceased to exist, but another collection, confined to books on military medicine, was started by a donation of Staff Surgeon Göluther in 1853 and was catalogued by Frölich in 1877. The Library of the School of Military Medicine at Val de Grâce (founded 1850) was catalogued (176 pp.) in 1861. The Library of the English Army Medical School at Netley (1860) was founded in 1862, but the collection goes back to the earliest times. The Surgeon General's Library at Washington, now surpassed only by the Library of the Paris Medical Faculty in number of volumes, was, in 1836, a modest office outfit of medical books in Surgeon General Lovell's room, and was developed to its present status (650,000 items) by Col. John S. Billings during his Washington period of active duty in the Army (1865-95), and by his successors. The Index Catalogue of this Library is now in its fortieth volume (1880-1921). The library and reading room of the Scuola d'applicazione di sanità militare at Florence was opened on January 1, 1883.

(To be continued)



THE ETIOLOGY OF SCURVY

By LIEUT. COLONEL EDWARD B. VEDDER

Medical Corps, United States Army

(With eight illustrations)

III. THE EFFECT OF NEUTRALIZATION ON THE ANTISCORBUTIC VITALIMENT

IN THE previous paper (1) it was stated that the final extract of orange juice prepared was very strongly acid. A large part of the acid in citrus fruits is citric acid, which has failed many times as an antiscorbutic, including my own experiments. Orange and lemon juice also contain many other organic acids and acid salts. It was desirable to determine the result of removing these acids. An extract free from citric or other acids was, therefore, prepared as follows:

Experiment 10, Part I: Filtered lemon juice was neutralized first with powdered calcium carbonate, and finally with sodium bicarbonate until the solution was neutral to Squibb's litmus paper. The neutralized juice was then diluted with absolute alcohol until precipitation of the salts was complete. The bulky precipitate, containing chiefly calcium salts of citric and other acids, was filtered off and the filtrate stored in a flask at room temperature.

Two guinea-pigs were placed on the scurvy producing diet described in the first paper, and were given in addition a daily dose of this filtrate equivalent to 5 c.c. of the original lemon juice. Before feeding this extract, it was evaporated before an electric blower until all the alcohol was driven off. Both guinea-pigs developed scurvy on about the fifteenth day and the disease became severe with progressive loss of weight. Both pigs died of scurvy, one in thirty days and one in thirty-six days. Therefore this alcoholic extract of neutralized juice did not protect.

Part II: The precipitate removed after neutralizing and diluting with alcohol and containing the calcium salts of the acids was suspended in water and fed to two guinea-pigs receiving the scurvy producing diet. The precipitate from 10 c.c. of juice was fed to each guinea-pig daily.

Both of these guinea-pigs developed scurvy in the usual time and died of scurvy on the nineteenth and twenty-seventh days, respectively. This precipitate, therefore, did not protect.

Now as neither the filtrate nor the precipitate protected, it was apparent that the antiscorbutic vitaliment was destroyed as the result of this treatment. The experiment was repeated several times, using orange juice, but always with the same result. The loss of the vitaliment might have been due either to the neutralization or to the fact that the antiscorbutic vitaliment deteriorates on standing in a neutral

alcoholic solution. It seemed most improbable that neutralization alone could cause this destruction. Harden and Zilva (2) have since found that when fresh orange juice is neutralized to phenolphthalein, it protected against scurvy for at least 78 days; but that when the juice was rendered $\frac{N}{20}$ or even $\frac{N}{50}$ to phenolphthalein by NaOH, it lost its protective power entirely. Hess (3) found that orange juice rendered slightly alkaline to phenolphthalein had marked curative effect on scorbutic infants when administered intravenously. But these results were not available at the time this work was performed, and accordingly

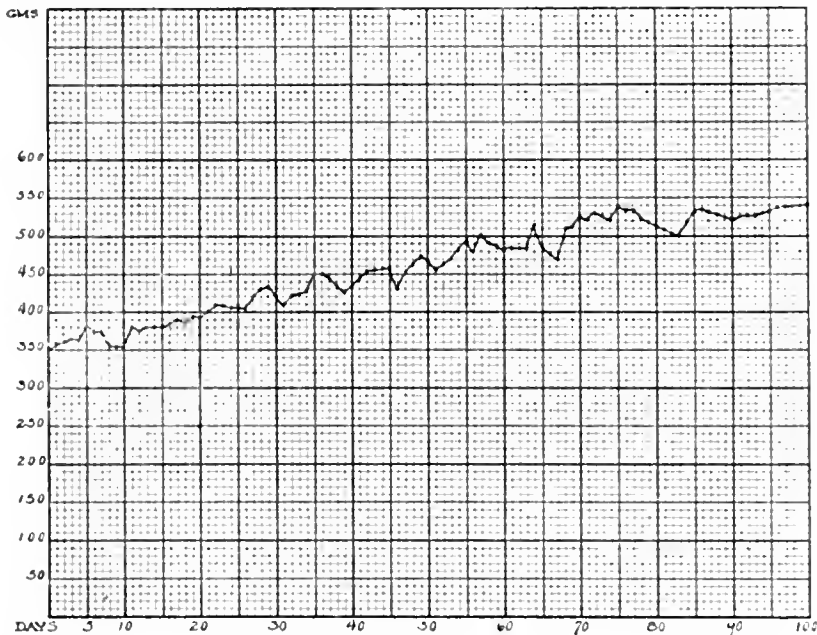


CHART 10. Lemon juice neutralized daily with calcium carbonate and 5 c.c. administered at once.

the following experiment was performed to test the effect of neutralization on the antiscorbutic vitaliment.

Experiment 11, Part I: Filtered lemon juice was neutralized to litmus daily with powdered calcium carbonate. As calcium carbonate is insoluble it may be added to excess. When no further carbon dioxide is given off all the free acid has been neutralized, but the solution is still distinctly acid to litmus paper. As soon as this neutralization was completed the juice was at once fed in 5 c.c. doses to a guinea-pig receiving the scurvy producing diet. This guinea-pig remained well and grew for one hundred days when the experiment was discontinued. (See Chart No. 10.)

Part II: Filtered orange juice was neutralized daily with sodium bicarbonate until solution was exactly neutral to litmus paper. This neutralized juice was at once fed to a guinea-pig receiving the scurvy producing diet. This guinea-pig was completely protected and grew normally for one hundred days, when the experiment was discontinued. (See Chart No. 11.) This experiment showed that neutralization alone did not destroy the antiscorbutic vitaliment. The next experiment was performed to determine the effect of neutralization and storage.

Experiment 12, Part I: Filtered orange juice was neutralized with powdered calcium carbonate added to excess. After standing for

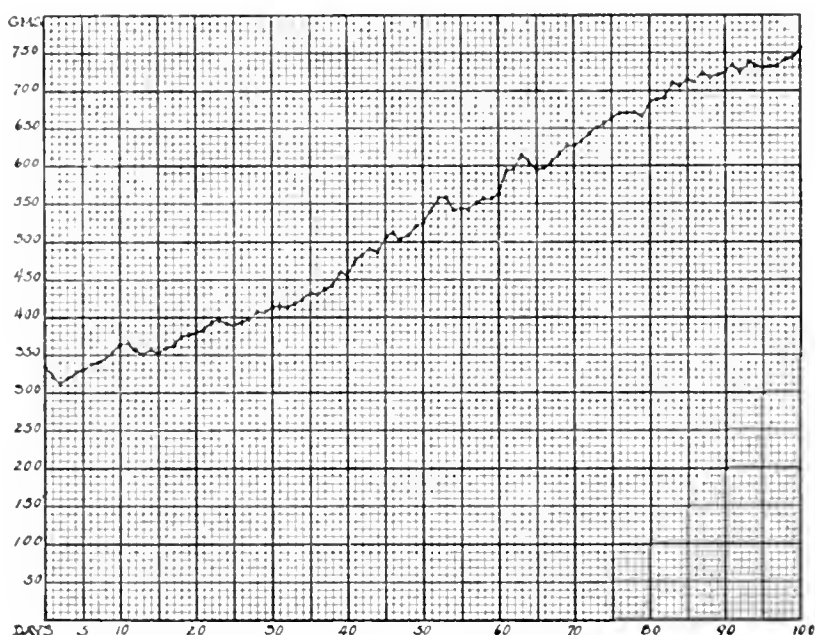


CHART 11—Orange juice neutralized daily with sodium carbonate and 5 c.c. administered at once.

twenty-four hours a heavy precipitate had formed. This was filtered off and the filtrate, which was neutral to litmus, was stored in a flask in the ice box with the addition of a few drops of chloroform to prevent decomposition and the growth of moulds.

A guinea-pig was placed on the scurvy producing diet and received in addition a daily dose of 5 c.c. of this neutralized and stored juice. This guinea-pig was completely protected and grew normally for one hundred days, when the experiment was discontinued. (See Chart No. 12.)

Part II: Filtered orange juice was neutralized with sodium bicarbo-

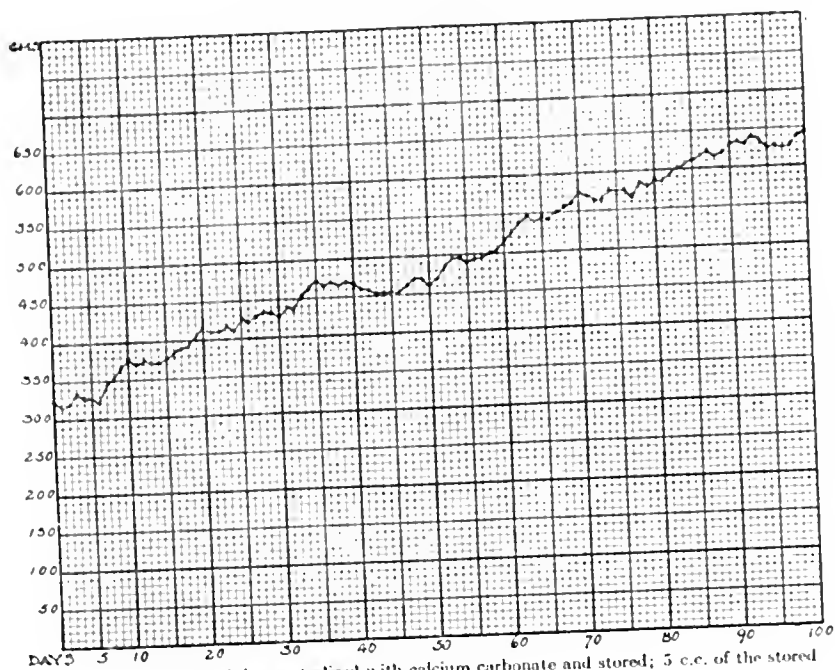


CHART 12.—Orange juice neutralized with calcium carbonate and stored; 5 c.c. of the stored juice administered daily.

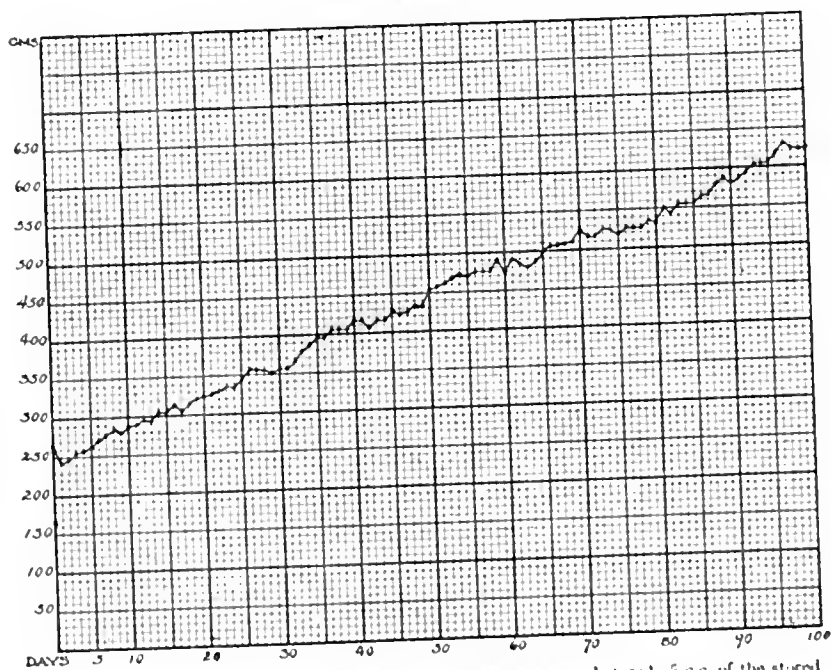


CHART 13.—Orange juice neutralized with sodium bicarbonate and stored; 5 c.c. of the stored juice administered daily.

nate until the reaction was precisely neutral to Squibb's litmus paper. This neutralized juice was then stored in the ice box with a few drops of chloroform. A guinea-pig was placed on the scurvy producing diet and received in addition 5 c.c. of this neutralized and stored juice. This guinea-pig remained well and grew normally for one hundred days, when the experiment was discontinued. (See Chart No. 13.)

It will be seen from this experiment that neutralization and storage in an aqueous medium does not destroy the antiscorbutic vitaliment. An experiment was now performed to determine whether the antiscorbutic vitaliment was soluble and active in neutral alcoholic solution.

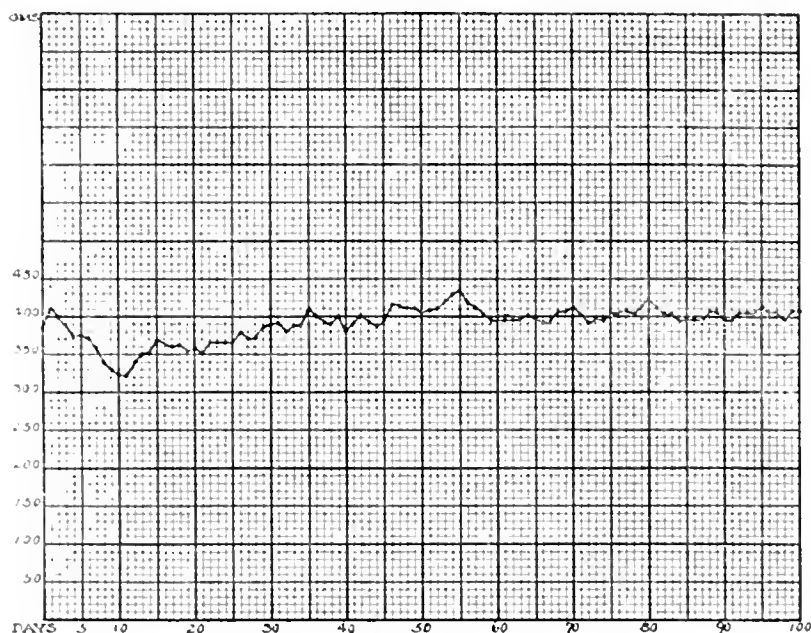


CHART 11.—Lemon juice neutralized daily and extracted with alcohol; 5 c.c. of neutralized alcoholic extract administered at once.

Experiment 13: Lemon juice was neutralized *daily* with calcium carbonate and then diluted with alcohol as in experiment 10. The bulky precipitate was filtered off and the filtrate at once evaporated until no alcohol remained.

A guinea-pig was placed on the scurvy producing diet and was given in addition a daily dose of 5 c.c. of this freshly prepared extract. This guinea-pig remained well, with no symptoms of scurvy, for one hundred days, when the experiment was discontinued. It did not gain properly in weight, however, as may be seen by consulting chart No. 14. In another experiment good growth was secured by giving a larger dosage

of the same extract. Since the antiscorbutic vitaliment was present in this extract and protected a guinea-pig from scurvy although all acids had been removed, it appears reasonable to conclude that none of the acids present in citrus fruits are important in the prevention of scurvy. The antiscorbutic vitaliment is not an acid. But inasmuch as 5 c.c. of this alcoholic neutralized extract was insufficient to produce growth, whereas 5 c.c. of a neutralized aqueous solution did produce good growth, it seems quite probable that the antiscorbutic vitaliment is altered in some way in neutral alcoholic solution. Furthermore, it is

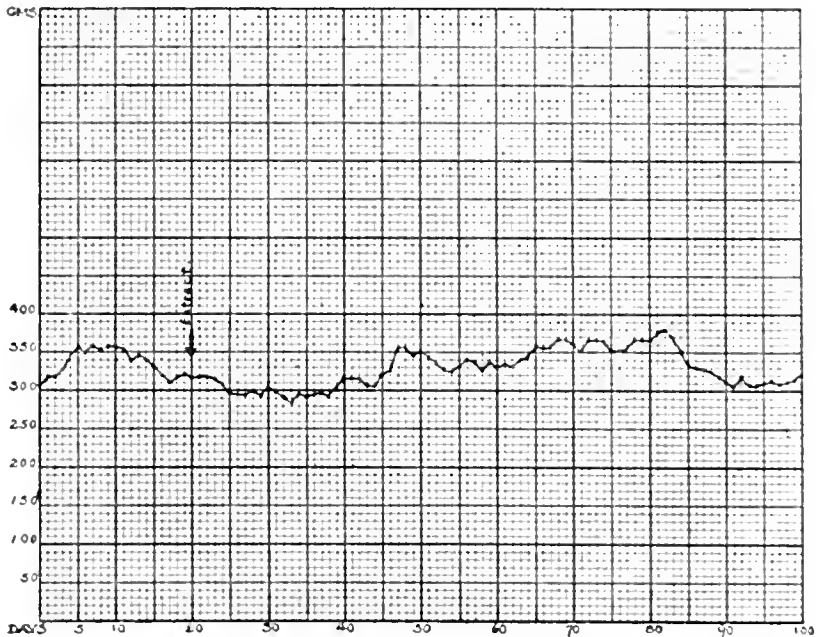


CHART 15.—Orange juice extracted with absolute alcohol, acetone, neutralized calcium carbonate. Alcohol added and filtrate stored and fed to guinea-pig that had already developed scurvy.

shown by experiment 10 that the antiscorbutic vitaliment is destroyed on standing in a neutral alcoholic solution, although it keeps for several months in neutral aqueous solution.

Experiments were now performed to test the effect of neutralization on other stages of the process of extraction described in experiment 9 as follows:

Experiment 14: Filtered orange juice was evaporated to dryness and extracted with absolute alcohol. The alcoholic extract was evaporated to dryness and the dry residue extracted with acetone. The filtered acetone extract was evaporated, a small amount of water added.

and this extract was neutralized with calcium carbonate. After neutralization was complete, absolute alcohol was added until precipitation was complete. The precipitate was filtered off and the alcoholic filtrate stored in a flask in the ice box. Before feeding, the alcohol in this extract was evaporated by an electric blower.

This extract was then given to a guinea-pig that had received only the scurvy producing diet for twenty days and had developed severe scurvy. It was found that about 100 c.c. of this extract for three successive days was sufficient to relieve all symptoms of scurvy. The scorbutic swellings disappeared and the guinea-pig appeared normal in

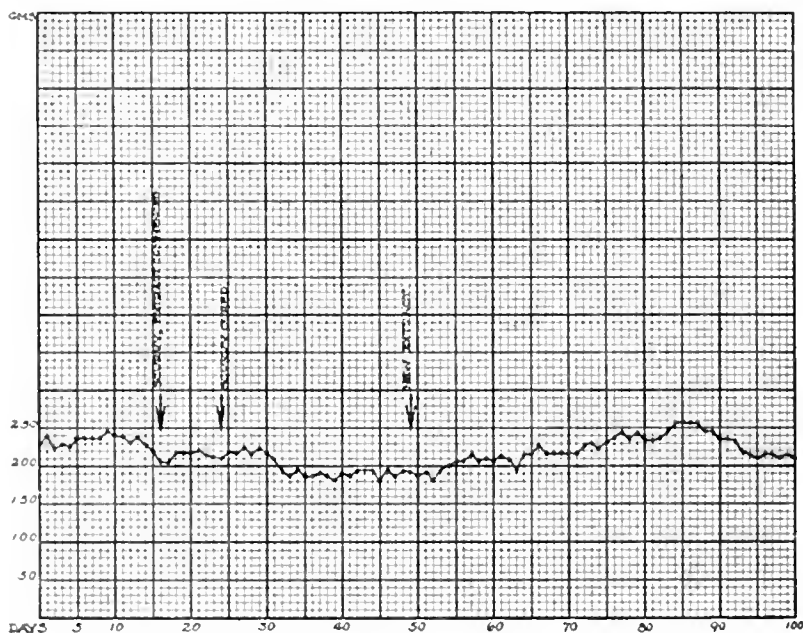


CHART 16.—Same as Chart 15, using grapefruit juice.

about five days, and had gained slightly in weight. Thereafter this guinea-pig was given a daily dose of 25 c.c. of the same extract. The guinea-pig suffered no recurrence of the usual symptoms of scurvy and lived for one hundred days, when the experiment was discontinued. (See Chart No. 15.) However, it will be seen that this guinea-pig did not increase in weight, although it did grow, becoming thinner as it increased in size. After about ninety days on this treatment, the incisor teeth became chalky, fragile, and broke off easily. The broken teeth continued to grow, but remained chalky and fragile. It is clear that although this extract was capable of curing scurvy and preventing the

appearance of the usual signs of scurvy in the guinea-pig, it is not sufficient for the promotion of normal growth. The experience was repeated, using an extract of grapefruit juice in place of orange juice, with precisely the same result. (See Chart No. 16.)

Experiment 15: Filtered orange juice was evaporated to dryness and extracted with absolute alcohol. The alcoholic extract was evaporated to dryness and the residue extracted with acetone. The filtered acetone extract was evaporated and the dry residue extracted with ether. The ether extract was discarded and the residue was diluted

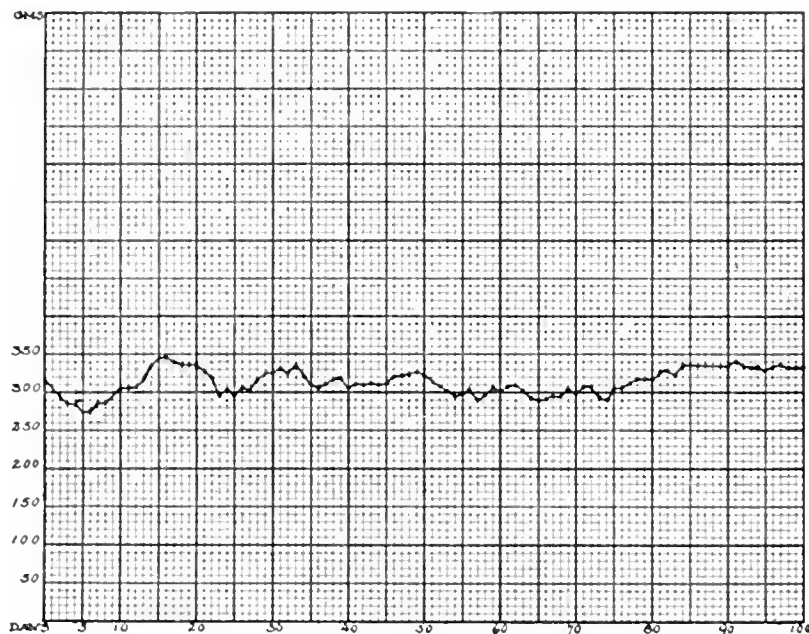


CHART 17.—Orange juice extracted absolute alcohol, acetone, neutralized and dried and extracted ethyl acetate. Ethyl acetate extract stored and fed to guinea-pig that had already developed scurvy.

with a small amount of water and neutralized by the addition of an excess of calcium carbonate until the solution was neutral to litmus. This neutralized extract was then evaporated to dryness by the electric blower. The dry residue was extracted with ethyl acetate. The ethyl acetate extract was stored in a flask at room temperature. An amount of this extract equivalent to 25 c.c. of the original juice was evaporated daily, redissolved in a small amount of water and fed to a guinea-pig that had already developed scurvy. This extract relieved the symptoms of scurvy in about ten days. The guinea-pig continued on the scurvy producing diet and a daily dose of this extract for 100

days, when the experiment was discontinued. It never developed any further symptoms of scurvy, but like the guinea-pig in experiment 14, it failed to grow. After fifty days the supply of this extract was exhausted and a fresh supply was prepared in a similar way, but growth was never satisfactory. (See Chart No. 17.)

CONCLUSIONS

1. The antiscorbutic vitaliment is neither an acid nor a salt of an acid, since an extract from which all acids and salts have been removed both prevents and cures scurvy.

2. The antiscorbutic vitaliment may be stored without impairment for at least several months in a neutral aqueous solution.

3. When orange or lemon juice is neutralized and diluted with alcohol it retains the antiscorbutic vitaliment if fed immediately, but this vitaliment is destroyed when this solution is stored.

4. When orange juice is extracted with alcohol, acetone, neutralized, and the soluble portion stored in alcohol, the solution cures and prevents scurvy, but does not produce normal growth. The antiscorbutic vitaliment must be altered in some manner by this treatment, but not entirely destroyed.

5. A similar result is obtained when orange juice is extracted with alcohol, acetone, neutralized, and the dry residue extracted by ethyl acetate.

DISCUSSION

These results suggest several interesting possibilities. First, that as the result of the action of certain solvents used, there has been some alteration in the chemical constitution of the antiscorbutic vitaliment; and secondly, that there may be two vitaliments present in fruit juices, one of which prevents scurvy and the other promotes growth.

There can hardly be any doubt that the first explanation is correct, although it does not necessarily exclude the second.

It was first shown that orange juice loses its antiscorbutic properties on standing in neutral alcoholic solution, although it retains its properties unimpaired in neutral aqueous solution. Yet after extraction with acetone, the extract retains its antiscorbutic properties in neutral alcoholic solution for from thirty to sixty days although it fails to promote growth. Again, when ethyl acetate extracts were first employed, it was noticed that smaller doses of these extracts produced a more rapid cure of scurvy and a much better growth than did larger doses of the acetone extract of the same juice.

If the solvents employed have no chemical action upon the antiscorbutic vitaliment, the reverse should be expected, for the extraction

was with alcohol, then acetone, and finally ethyl acetate. And, as some of the active material is lost in each extraction, the final ethyl acetate extract should be weaker than the acetone extract. The antiscorbutic vitaliment is therefore of such a chemical nature that it is more or less active, depending upon the solvent used.

It has been found by Byfields and Daniels (4) and others that an increase in the dose of antiscorbutic vitaliment would increase growth, for when a dose of 15 c.c. of orange juice was increased to 45 c.c. in the case of infants whose weight had remained stationary, there was a marked increase of growth. This is not the explanation of the results in experiments 14 and 15, because a marked increase in the dose of the extracts used failed to produce growth.

On the other hand, the possibility that there is a growth producing vitaliment should not be hastily discarded. The existence of such a vitaliment has been suggested several times by various investigators. The theory has not received credence simply because it was generally easy to show that proper growth would occur when a sufficiency of the three known vitaliments (antineuritic, antiscorbutic, fat soluble) was provided, and it is well known that a deficiency in the amount of either vitaliment will cause diminution in rate of growth.

But, in these experiments, probably for the first time, we have a vitaliment so split that it still cures and prevents scurvy in moderate doses although remaining incapable of causing growth even in large doses; while at the same time it can be shown that these animals were receiving a sufficiency of all other food constituents, including both other known vitaliments (fat soluble and antineuritic).

Therefore either there are two separate vitaliments, one of which prevents scurvy and the other promotes growth, or else one substance, the antiscorbutic vitaliment, contains two chemical nuclei, one of which cures scurvy but cannot produce normal growth when the second chemical nucleus is split off. The distinction may be important from a chemical viewpoint, but from the viewpoint of the physiologist it appears that, accepting either explanation, there is some chemical substance supplied in food that is definitely associated with the power of causing growth.

In the previous paper it was stated that by the process described in experiment 9 an extract was obtained which was acid, reduced Benedict's solution, contained no nitrogen, no lipoids, no proteins or amino acids. In the present experiments it has been shown that the antiscorbutic vitaliment is neither an acid nor a salt. It has further been found that by repeated extraction with the solvents described, an extract which still retains the antiscorbutic vitaliment may be prepared which

no longer reduces Benedict's solution or ferments with yeast. This with other reactions indicates that the antiscorbutic vitaliment is not a carbohydrate. The extract does not give the ordinary tests for aldehydes or ketones. The antiscorbutic vitaliment can hardly be an ester because of its great solubility in water as compared with all other solvents. The extract presumably does not contain phenols since it gives a negative reaction with Folin and Denis' uric acid and phenol reagent.

The antiscorbutic vitaliment is apparently an active reducing agent. It promptly decolorizes potassium permanganate, aqueous solutions of fuchsin, and is rendered inactive by hydrogen peroxide, sulphuric acid, and alkali hydroxides, all of which reactions suggest that this substance has a strong affinity for oxygen and that it loses its physiological action when it becomes oxidized.

I wish to acknowledge the assistance of Capt. Brooks C. Grant, M. C., who has aided me in carrying out the details of these experiments.

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THE DIFFERENTIAL DIAGNOSIS OF THE COMMON INTESTINAL AMOEBAE OF MAN¹

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THE very extensive studies of the intestinal amoebae of man by Wenyon and O'Connor, Jepps, Dobell, Kofoed and others during the World War have called attention again to the importance of these parasites in human pathology and renewed interest in their life history and differential diagnosis. The observations of these workers have confirmed those of previous writers regarding the frequent occurrence of *Endamoeba coli* in healthy individuals as well as in those suffering from other diseases than dysentery and the harmless nature of this parasite. In addition their observations have shown that a considerable proportion of healthy appearing individuals harbor the pathogenic *Endamoeba histolytica*; that a third species of amoeba hitherto undescribed is frequently found in health and in individuals suffering from other diseases than dysentery, and that this species, *Endamoeba nana*,² is in all probability a harmless commensal, as is *E. coli*.

The importance of differentiating between these three species of amoebae is apparent if our statistics regarding the occurrence of amoebic dysentery are ever to approach scientific accuracy and if our efforts at prophylaxis and treatment of this serious infection are to be efficient. It is only within the past few years that much effort has been made to differentiate between the different species of amoebae commonly occurring in the intestine of man, and even today it is believed that the vast majority of physicians accept the presence of any amoeba in the feces as evidence of the existence of infection with the pathogenic *E. histolytica*. The mere finding of an amoeba in the feces means nothing unless the species be identified, and at the present time the diagnosis of amoebic dysentery based on anything less than the identification of the amoeba present as *E. histolytica* is unjustifiable and valueless.

It is a well-known fact that *E. histolytica*, although capable of causing the severe type of dysentery known as amoebic or endamoebic dysentery, may be found in the feces of apparently healthy individuals long before any symptoms of its presence are noted, and such individuals are true "carriers" of the infection and their recognition of the utmost

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² *Endamoeba nana* was placed in a new genus, *Endolimax* by Brug. in 1918, and this classification is accepted by Dobell and others. However, the writer is still unconvinced that this species should be placed in any other genus than *Endamoeba* and for this reason the name *Endamoeba nana* will be used in this paper instead of *Endolimax nana*.

importance from the standpoint of prophylaxis and treatment. In order to recognize them it is necessary to differentiate the amoeba present from *E. coli* and *E. nana*, and fortunately this can be done without very great difficulty by one having some experience in the examination of these organisms.

The differential diagnosis of *E. histolytica*, *E. coli*, and *E. nana* rests upon the morphological characters of these parasites as noted in fresh living specimens and in stained preparations. In the vast majority of instances a differential diagnosis may be made between them by studying fresh unstained material containing them and material stained with the iodine solution to be described. In doubtful cases it is necessary that they be stained with one of the hematoxylin stains preceded by wet fixation as described under "Technique."

Technique.—The intestinal amoebae of man can be differentiated in the living condition or in stained preparations. In the vast majority of instances several preparations will have to be carefully examined before an opinion can be given regarding the species that may be present, as combined infections with two or even all three of these amoebae are not infrequent and, unless the preparations are carefully studied, may give rise to much confusion.

If it is desired to examine the living amoebae, the specimen of feces should be examined immediately after passage, as the nucleus of the amoebae, upon which a differential diagnosis is based in stained material undergoes marked morphological changes, degenerative in character, very soon after the feces are voided, and may become visible in *E. histolytica*, whereas normally this species has no visible nucleus in the vegetative stage if the living parasite is examined. Motility is also at its height immediately after the feces are passed and, as this is of some value in differentiating the species, the examination of freshly passed material is essential.

If the feces are from a case of acute dysentery, the best material to examine is the bloody mucus which is generally present, while, if the stool is formed, a small amount of material should be taken from the surface and emulsified as directed.

Each of the three amoebae under discussion has three well-marked stages in its life-cycle: a vegetative stage, a pre-cystic stage, and a cystic stage of development. The vegetative stage occurs generally only in fluid or semifluid stools, the pre-cystic stage in semifluid and formed stools, and the cystic stage in formed stools. These facts should be remembered in examining material and, if it is desired to study the motile amoebae and the stools are formed, a purgative should be given, as motility is a phenomenon of the vegetative stage of the life cycle.

If it is desired to study the cysts, a purgative should not be administered, as these forms of the parasite occur in semiformed or formed stools.

Preparation of Living Specimens.—If the feces contains mucus and blood, a small amount of this is taken up with the platinum loop, placed upon a microscopic slide, covered with a cover glass, and examined at once with a one-sixth or one-eighth dry lens and a low ocular. Later an oil immersion lens may be used in order to bring out finer details of structure if necessary. If the feces be formed, a small amount of material is scraped from the surface of the fecal mass and emulsified in normal salt solution upon a microscopic slide, covered with a cover glass and examined as already noted.

In examining unstained living specimens it is most important that the feces be examined immediately after passage, or at most within a few moments, if from a case showing acute symptoms and it is desired to differentiate the vegetative, motile stage of the amoebae. If the feces are formed and it is desired to study the cysts, it is not necessary that the material be freshly passed, as feces even a day or two old will show cysts that can be easily differentiated. However, it is best to examine the formed stools as soon after passage as possible.

Preparation of Stained Specimens.—For differential diagnostic purposes the following method of staining the amoebae will prove satisfactory where it is desired to differentiate only the cystic stage.

Solution Employed.—A one per cent watery solution of potassium iodide saturated with iodine.

Method of Staining.—A small portion of the feces to be examined is emulsified with the iodine staining solution upon a microscopic slide and covered with a cover-glass. The preparation should be allowed to stand for at least ten minutes before being examined, being ringed with vaseline to prevent evaporation. The cysts appear as slightly yellowish stained bodies within which the nuclei are distinctly visible and can be easily counted and the morphological details noted.

When it is desired to prepare permanent stained specimens or when the iodine stained specimens are insufficient to differentiate the species of amoeba present, some one of the many excellent hematoxylin staining methods preceded by wet fixation should be used. Of these methods perhaps the most easily and quickly applied is that recommended by the Committee upon Pathological Methods of the Medical Research Council (see Reports, Medical Research Council, Special Reports Series No. 51. London, 1920). This method has been used by the writer with excellent results and is briefly as follows:

Method of Fixing and Staining.—The specimen should be obtained from a freshly passed stool if the vegetative motile amoebae are to be

stained. This is not necessary in the cases of the cysts, which remain alive in feces for several days and retain their staining capacity. Before staining the material must be fixed and the fixing solution is the following: Saturated solution of bichloride of mercury in water, 2 parts; absolute or 96 per cent alcohol, 1 part. Mix and add to each 100 c.c. of the mixture, 5 c.c. of glacial acetic acid. This solution will keep for months.

A small portion of bloody mucus or an emulsion of the feces, if it be from a formed stool, is smeared with a platinum loop upon a cover-glass and immediately placed film side downward upon the fixing solution in a small Petrie dish or watch-glass, or the cover-glasses may be allowed to sink in the solution, film side upward. Fixation is accomplished in from ten to twenty minutes, the vegetative amoebae being fixed in from ten to fifteen minutes, but the cysts should be allowed the full time.

After fixation the films should be thoroughly washed by being carried through 50 per cent alcohol, 70 per cent alcohol, and 70 per cent alcohol to which a few drops of the iodine solution already described have been added. In this they should remain for thirty minutes and then be placed in 35 per cent alcohol for a few minutes after which they are transferred to distilled water. After remaining in this for a few minutes they are stained for from ten to twenty minutes with the following staining solution: Hematoxylin, 1.0 gm.; distilled water, 1,000 c.c. Dissolve the hematoxylin and then add: Sodium iodate, 0.2 gm.; alum (potash), 50 gm.

The vegetative amoebae are more easily stained than the cysts, and the latter should be stained for the full twenty minutes and sometimes for a longer time. If the preparations are overstained, they may be decolorized with acid alcohol.

After staining, the preparations are washed in tapwater until they become blue and are then dehydrated and mounted. Dehydration is accomplished by carefully carrying the preparations through 35 per cent alcohol, then 70 per cent alcohol, and finally absolute alcohol, after which they are transferred to equal parts of absolute alcohol and xylol and then cleared in pure xylol and mounted in balsam.

Good stained preparations are hard to obtain, and it is necessary to be sure that at no stage of the fixing, staining or dehydration process do the preparations dry. They must be kept wet throughout the process or poor results will be obtained. It is also necessary that the dehydration process be carefully carried out and at least from five to ten minutes be allowed in each solution before advancing the preparation to the next solution.

With this stain the cytoplasm of the endamoebae appears of a bluish-gray color, while the nucleus is well defined, the nuclear membrane, the karyosome, and the chromatoid bodies staining a deep brown or black.

The Differentiation of E. histolytica, E. coli and E. nana in the Vegetative Stage of Development.—*Unstained Preparations:* The morphology of these parasites in the vegetative stage of development varies considerably, but if freshly passed stools are examined the three species may be differentiated without much difficulty. If old stools are examined, the organisms will be found to vary exceedingly in morphology due to the degenerative changes which occur, and many of the mistakes that have been made in the descriptions of these amoebae, especially as regards their nuclear structure, are due to the study of stained preparations of degenerated amoebae.

Size.—With the exception of *E. nana*, size is of little value in differentiating these amoebae. While *E. histolytica*, as observed in the feces in acute amoebic dysentery, is usually larger than is *E. coli*, individual specimens of *coli* are seen which are as large as the average *histolytica*, so that a differentiation based alone upon size is impossible. However, in the case of *E. nana*, the fact that it is smaller than even the average of either *E. histolytica* or *E. coli* renders the size of this parasite of diagnostic importance.

E. histolytica measures from 18 to as much as 80 microns in diameter, the latter measurement being very rarely attained. The average specimens in the motile vegetative stage measure from 20 to 35 microns in diameter when spherical, and considerably more in the long diameter when moving.

E. coli may measure from 15 to 50 microns in diameter, the average measurement being from 20 to 30 microns in diameter. *E. nana* is a much smaller organism, measuring from 6 to 12 microns in diameter, the average living vegetative form measuring about 8 microns in diameter or, roughly, the size of a red blood corpuscle. In stained preparations the average diameter is about 7 microns, the organism being almost exactly the size of a red blood corpuscle. From the measurements given it will be seen that size is not of importance in the differentiation between *E. histolytica* and *E. coli* but that it is of considerable importance in differentiating these species from *E. nana*, the latter being much smaller than the smallest vegetative forms of either *histolytica* or *coli*.

Motility.—In the freshly voided feces the vegetative stage of *E. histolytica* is very actively motile, and the motility is of a marked progressive character, the parasite moving forward by means of rapidly extruded pseudopodia formed of the ectoplasm and into which the

endoplasm flows, thus producing a progressive motility. In *E. coli* the motion is very sluggish and very rarely progressive in character, the organism sending out pseudopodia but withdrawing them before the endoplasm flows into them, thus remaining stationary. When progressive motion is observed it is very slow and creeping rather than rapidly rolling as in *E. histolytica*. In *E. nana*, unless the specimen of stool be examined immediately after passage, no motility is observed. In freshly passed material this parasite shows a very sluggish form of motility, consisting in the protrusion and withdrawing of the pseudopodia with practically no progressive motion. Of the three species, *E. histolytica* is most motile, *E. coli* next, and *E. nana* least motile. If an amoeba is observed in the feces which possesses rapid progressive motion, it is, in all probability, an example of *E. histolytica*, for in the writer's experience neither *E. coli* nor *E. nana* ever show rapid progressive motion.

The Pseudopodia.—The pseudopodia are formed by the ectoplasm in all three species, and their character is of diagnostic value. In *E. histolytica* the pseudopodia are large, finger or blade shaped, and perfectly clear and glass-like in appearance. They appear to be of considerable consistency and strength. The pseudopodia of *E. coli* are much smaller, being rather broad and blunt, and do not present the glass-like appearance of those of *histolytica*. They appear to be more fragile and are never long and finger or blade shaped as in *histolytica*. The pseudopodia of *E. nana* are short and blunt, very minute in size in comparison with *histolytic* or *coli*, and have a very weak and fragile appearance. The pseudopodia are so characteristic in the case of *E. histolytica* that one may almost make a diagnosis of the species from this morphological feature alone, and when an amoeba is observed showing such pseudopodia, accompanied by rapid progressive motion, the diagnosis may be made without hesitation.

The Cytoplasm.—The cytoplasm of these parasites is divided into two portions, the ectoplasm and the endoplasm. The ectoplasm forms the pseudopodia which have been described and is sometimes visible in *E. histolytica* when the organism is motionless and spherical in shape as a glass-like layer surrounding the more granular and darker gray endoplasm. There is never any distinction between the ectoplasm and endoplasm in either *E. coli* or *E. nana* when the organisms are motionless, and even when pseudopodia are being protruded the distinction between these two portions of the cytoplasm is very slight.

The endoplasm of *E. histolytica* is free from bacteria and vacuoles in specimens which have been freshly passed in the feces or in the parasites removed from ulcers in the intestine. After the feces have stood

for some time the endoplasm of this species may be filled with vacuoles, but this is now believed to be a degenerative change. Food vacuoles may be present and may contain red blood corpuscles, leucocytes, or tissue cells. *The ingestion of red blood corpuscles by this species of endamoeba is a most important diagnostic character, for it is true that red blood corpuscles are not ingested by either E. coli or E. nana.* The writer has always urged the value of this phenomenon in the differentiation of *E. histolytica*, and his observations in this respect have been confirmed by the recent work of Wenyon and O'Connor and Dobell who state, as the writer did years ago, that an amoeba showing red blood corpuscles within its endoplasm may safely be diagnosed as *E. histolytica*. The ingestion of red blood corpuscles by *E. coli* has been described by the writer and others, but in the light of accumulated experience it is probable that these organisms were specimens of *E. histolytica* and were mistaken for *E. coli*.

The endoplasm of *E. coli* is filled with food vacuoles in which bacteria, starch grains and the cysts of intestinal flagellates may be found. Red blood corpuscles do not occur in the endoplasm. The vacuole-filled endoplasm of *E. coli* is in marked contrast to the homogeneous appearing endoplasm of *E. histolytica*, for the latter species does not contain numerous vacuoles unless degenerative changes are occurring.

The endoplasm of *E. nana* is also filled with food vacuoles containing bacteria, but red blood corpuscles are never observed in this species.

The Nucleus.—The nucleus of *E. histolytica* is not visible in the living vegetative stage of growth unless the feces containing the parasite has stood for some time, when it may become visible as an irregular ring of refractive granules. The nucleus of *E. coli* is generally visible in the living vegetative stage as a ring of rather large refractive granules containing within it one or more refractive granules which represent the karyosome. The nucleus of *E. nana* is rarely visible in this stage of development in the unstained preparation.

Summary.—From what has been said it will be evident that the differentiation of *E. histolytica*, *E. coli* and *E. nana*, in the living condition and during the vegetative stage of development, rests upon several factors, and these are summarized in the diagnostic table accompanying this contribution. Briefly stated, if one finds in the specimen of stool examined a large actively motile amoeba, showing progressive motion, the pseudopodia being well differentiated from the endoplasm and finger-like in shape, while the endoplasm contains red blood corpuscles, one would be justified in making a diagnosis of *E. histolytica*. On the other hand, if the amoebae present are only sluggishly motile, the pseudopodia poorly differentiated and no progressive motion is present,

while, although the stool contains blood, no red blood corpuscles are present within them, although numerous vacuoles are present, the diagnosis would be *E. coli* or *E. nana*, the latter being differentiated by its small size from either *histolytica* or *coli*.

Stained Preparations.—The differentiation of *E. histolytica* and *E. coli* during the vegetative stage of development in preparations stained with the hematoxylin stains after wet fixation depends almost entirely upon the morphology of the nucleus and on the presence of red blood corpuscles within the endoplasm of the parasites. If the latter be present, the diagnosis of *E. histolytica* is justifiable, but if erythrocytes are not present the morphology of the nucleus furnishes the only certain criterion of differentiation between these organisms, although if the preparations be made from perfectly fresh material the presence of vacuoles and other inclusions will serve to assist in the differentiation.

The Nucleus in Stained Preparations.—In order to differentiate these species of amoebae it is absolutely essential, if stained preparations are employed, to stain the parasites immediately after the feces are passed, as otherwise the nuclear structures are much altered, especially in *E. histolytica*. In fresh feces, or in material scraped from ulcerations in the intestine, the nucleus of this species is very characteristic, presenting a very delicate nuclear membrane, stained black with the hematoxylin stains, and covered upon its inner surface by a single layer of very minute chromatin granules, arranged in contact or separated by minute intervals. These chromatin granules are all of about the same size and stain intensely. At the center of the nucleus there is a very small karyosome, less than one micron in diameter, which stains uniformly black, there being no evidence of a centriole. The karyosome is surrounded by an unstained halo. Between the karyosome and the nuclear membrane, in well-stained preparations, there are delicate strands or threads forming the linin network, which are generally poorly defined, but in normal individuals the nucleus of *E. histolytica* never presents any granules of chromatin between the karyosome and the nuclear membrane. In degenerating specimens the nuclear membrane may appear much thicker, the chromatin granules lining it coarse and irregular in arrangement, while the karyosome may be larger and there may be numerous granules of chromatin between it and the nuclear membrane. These appearances gave rise to the so-called "tetragena" type of nucleus, which was undoubtedly described from degenerating specimens of this species.

The nucleus of *E. coli* is quite different in appearance. The nuclear membrane is considerably thicker than that of *E. histolytica*, and the layer of chromatin granules upon its inner surface are larger and more

intimately in contact with one another. The karyosome is situated to one side of the nucleus in most individuals and is at least twice as large as that of *histolytica*, measuring one micron or more in diameter. It is surrounded by a well-marked, unstained halo, the linin network of the nucleus is well differentiated, and between the karyosome and the nuclear membrane numerous chromatin granules are normally present.

The nucleus of *E. nana* is very characteristic, and there is little chance of confusing this species with either *histolytica* or *coli* if one has once seen well-stained preparations of these amoebae. The nuclear membrane is well defined and about as thick as that of *E. coli*, but it is not covered internally with chromatin granules, as a rule only a few granules being visible widely separated from one another. The distinguishing feature of the nucleus, however, is the karyosome, which is composed of one or more masses of chromatin arranged in a very irregular manner. Usually there is one large spherical or oval mass of chromatin placed at one side of the nucleus close to the nuclear membrane, and this is connected by a delicate thread with one or more smaller masses, also placed eccentrically. In many individuals the nucleus appears to have a disproportionately large karyosome, composed of a single round or oval mass of chromatin, surrounded by an unstained halo, and such individuals have been mistaken for free living amoebae. There is a very great diversity in the appearance of the karyosome of this species, and this enables it to be easily differentiated from *histolytica* or *coli* nuclei which are so very regular in their morphology, varying but little save in degenerated specimens.

In stained preparations prepared from material which has stood for even short periods of time after passage from the intestine, degenerative forms of the three species under discussion occur, and in these forms the morphology of the nucleus is generally so distorted that it is often impossible to differentiate between *E. histolytica* and *E. coli*. The nucleus of *E. nana*, however, can usually be differentiated from the two former species, even in old material, by its smaller size and peculiar karyosome, and in such material the nucleus often very closely resembles that of *Vahlkampfia*, a genus of free-living amoebae.

In addition to the character of the nuclei in the species of amoebae under discussion, some help in differentiation, in stained preparations, is given by the character of the cytoplasm. In *E. histolytica* the cytoplasm appears granular and homogeneous and is free from vacuoles, unless degeneration is occurring, and bacteria and other included bodies, with the exception of red blood cells, are not present. The cytoplasm of *E. coli* is filled with vacuoles, and bacteria, crystals and other included material are common, while the cytoplasm of *E. nana* is also much

vacuolated and bacteria are usually present. Red blood corpuscles do not occur in the cytoplasm of either *E. coli* or *E. nana*.

The Differentiation of E. histolytica, E. coli and E. nana in the Precystic Stage of Development.—While in certain instances it is possible to differentiate between *E. histolytica* and *E. coli* in the precystic stage of development, in the vast majority of specimens one examines it is impossible to do so, and for this reason the diagnosis should be based upon the character of either the vegetative or cystic forms that are fortunately present in smaller number in material containing the precystic forms, in many instances. It may be stated that neither in the fresh living condition nor in stained preparations is it generally possible to differentiate between the precystic forms of *E. histolytica* and *E. coli*, and if only the precystic forms are present one should be very cautious in giving an opinion as to which species is present. The precystic forms of *E. nana* are likewise distinguished with difficulty from the precystic forms of either *histolytica* or *coli* if these forms originate from races or strains producing small cysts; but the character of the nucleus is of more assistance in this species, as it shows the same irregular karyosome that is seen in the vegetative stage of development.

The Differentiation of E. histolytica, E. coli and E. nana in the Cystic Stage of Development.—The cysts of *E. histolytica*, *E. coli* and *E. nana* can be differentiated in the iodine stained preparations, but the best results are obtained with wet fixation and one of the hematoxylin stains. The cysts occur in the formed or semiformed stools, and their recognition is of the utmost importance in the search for "carriers" of *E. histolytica* and in determining the effect of treatment in amoebic dysentery.

Unstained Preparations.—In the living unstained condition the cysts of all three species appear in the material under examination as hyaline bodies, which may show within them refractive granules and nuclei. The cysts of *histolytica* and *coli* are usually spherical in shape, although they may be oval or irregular, while those of *nana* are generally oval but may be spherical or irregular. There is much more variation in the shape of the cyst of *nana* than in either *histolytica* or *coli*.

Size.—The cysts of both *E. histolytica* and *E. coli* vary much in size, and it is now known that there are several races of both parasites characterized by the production of cysts of different size. Thus some races produce cysts as small as 5 microns in diameter, while others produce cysts measuring over 20 microns in diameter. The cysts of *E. histolytica* may measure from 6 to over 20 microns in diameter,

the average being from 7 to 15 microns. The cysts of *E. coli* may measure from 10 to 22 microns in diameter, the average being from 12 to 15 microns in diameter. The cysts of *E. nana*, being oval in shape, measure from 8 to 12 microns in length by 7 to 10 microns in breadth, in most instances, but smaller cysts are observed measuring from 4 to 6 microns in diameter. In general it may be said that the cysts of this species are smaller than those of *E. histolytica* or *E. coli* and are distinguished by their oval or ellipsoidal shape.

Cyst Wall.—The cyst wall in all three species is very delicate and single in outline. There is nothing of differential value to be noted, but rarely, especially in *E. coli* cysts, the wall may present a double outline.

Cytoplasm.—Before encystment the cytoplasm in all three species becomes free from included bodies and appears clear and homogeneous. The nuclei can seldom be distinguished or counted in the living unstained preparations, and for this reason such preparations are of little value in diagnosis. A large vacuole may sometimes be observed, especially in the cysts of *E. coli*, and large refractile bodies, the chromidial bodies to be described, are sometimes well differentiated in the cysts of *E. histolytica*.

Stained Preparations.—In preparations stained with the iodine solution, which is especially useful in ordinary diagnostic work, it is possible to differentiate the cysts of the three species with little difficulty in most instances, by attention to the number of nuclei present. The iodine solution renders the nuclei visible, and it is possible to count them. It will be found that the cysts of *E. histolytica* contain from one to four nuclei, the fully developed cyst containing four nuclei; the cysts of *E. coli* from one to eight or more nuclei, the normal, fully developed cysts containing eight nuclei; while the cysts of *E. nana* contain from one to four or, rarely, eight nuclei, the normal fully developed cyst containing four nuclei. The cysts of *E. coli* may contain as many as twenty-four nuclei, and cysts containing from ten to sixteen nuclei are not so very uncommon, but the writer has never seen more than four nuclei in the cysts of *E. histolytica*.

Glycogen masses, staining brown with the iodine solution, occur in the cysts of *E. histolytica* but are much more prominent in the young cysts of *E. coli*. They are not of differential importance.

In preparations wet fixed and stained with one of the hematoxylin stains, the differential characteristics of the cysts of the species under discussion are more easily distinguished and consist in the number and structure of the nuclei present and the morphology of the chromidial bodies within the cysts.

As already stated, the normal, fully developed cyst of *E. histolytica* contains four nuclei, that of *E. coli* eight nuclei, and that of *E. nana* four nuclei, and the morphology of these nuclei, as observed in properly stained preparations, is similar to that of the typical nucleus of each species as observed in the vegetative stage of development. The nuclei of cysts of *E. histolytica* present the delicate nuclear membrane, the minute, centrally situated karyosome, and the absence of chromatin between the karyosome and the nuclear membrane, as in the vegetative forms; the nuclei of *E. coli* cysts show the thicker nuclear membrane, the larger, eccentrically situated karyosome, and granules of chromatin between it and the nuclear membrane, as in the vegetative form; and the nuclei of the cysts of *E. nana* present the same peculiar divided karyosome which has been described for the vegetative stage of development.

Chromidial Bodies.—Chromidial bodies, as they are called, occur in a certain proportion of the cysts of *E. histolytica* and *E. coli* and are of great diagnostic importance. The exact nature of these bodies is not known, but they stain like chromatin and appear as very dark brown or black bodies within the cysts when stained with hematoxylin. The chromidial bodies of *E. histolytica* occur in approximately 50 per cent of the cysts if the feces be examined immediately after passage, but they disappear from the cysts after the feces have been passed for some hours. With the iodine stain the chromidial masses are rendered quite distinct, but they are much more definite in hematoxylin stained preparations, consisting of large bar-like, oval or spindle-shaped masses with rounded ends lying in the cytoplasm of the cysts to one side of the nuclei. In *E. coli* chromidial masses also occur, but they are quite different in character, being long, slender, spicular masses with fractured or sharp ends, resembling a bundle of slender crystals. The large blocks and bars of chromatin with rounded ends are never observed in *E. coli*. *E. nana* cysts do not show any chromidial masses comparable to those noted in *E. histolytica* or *E. coli*, but small granules and rods of some material staining like chromatin occur, the nature of which is uncertain.

Summary.—Briefly summarized, the characteristics upon which a differential diagnosis of the cysts of *E. histolytica*, *E. coli* and *E. nana* is based are the following:

The cysts of *E. histolytica* are generally spherical in shape and contain from one to four nuclei, the nuclei having the morphological characteristics described for the nucleus of the vegetative stage. In addition, the cysts contain characteristic chromidial bodies.

The cysts of *E. coli* are generally spherical in shape and contain

from one to eight nuclei, the nuclei having the same morphology as the nucleus of the vegetative stage of development. Chromidial bodies, differing in morphology from those observed in *E. histolytica*, are present in a small proportion of the cysts.

The cysts of *E. nana* are oval or ellipsoidal in shape and contain from one to four nuclei having the same morphological characters as the nucleus of the vegetative stage of development. There are no chromidial bodies in the cysts of this species comparable with those occurring in the cysts of *E. histolytica* or *E. coli*.

The following table, giving the most important differential diagnostic features of the amoebae considered in this contribution, will be found of service in their differentiation:

DIAGNOSTIC POINTS IN THE DIFFERENTIATION OF ENDAMOEBIA HISTOLYTICA, ENDAMOEBIA COLI AND ENDAMOEBIA NANA

VEGETATIVE STAGE OF DEVELOPMENT, LIVING SPECIMENS

	<i>Endamoeba histolytica</i>	<i>Endamoeba coli</i>	<i>Endamoeba nana</i>
Size	18 to 80 microns. Average 20 to 35 microns.	15 to 50 microns. 20 to 30 microns.	6 to 12 microns. 8 microns.
Motility.....	Very active and progressive.	Sluggish. Rarely progressive.	Sluggish. Not progressive.
Cytoplasm	Ectoplasm and endoplasm well differentiated in active organisms.	Ectoplasm and endoplasm very poorly differentiated.	Ectoplasm and endoplasm poorly differentiated.
Pseudopodia	Large, finger-shaped, clear and glass-like in appearance.	Shorter and blunt. Not glass-like in appearance.	Broad and blunt. Not glass-like.
Vacuoles	Not present in most fresh living specimens.	Endoplasm filled with vacuoles.	Endoplasm filled with vacuoles.
Inclusions	Red blood corpuscles. No bacteria, crystals or other material.	Numerous bacteria, crystals and other material. No red blood cells.	Numerous bacteria. No red blood cells.
Nucleus.....	Generally invisible	Visible	Generally invisible.

VEGETATIVE STAGE OF DEVELOPMENT, STAINED SPECIMENS

Structure of nucleus	<i>Endamoeba histolytica</i>	<i>Endamoeba coli</i>	<i>Endamoeba nana</i>
Nuclear membrane	Delicate. Inner surface lined with single layer of minute chromatin grains.	Thicker. Inner surface lined with coarser chromatin grains.	Intermediate in thickness. Chromatin grains rarely observed on inner surface.
Karyosome	Very minute. Situated in center of nucleus.	About twice as large as in <i>histolytica</i> . Situated eccentrically.	Large and usually divided into one large and one or more small portions connected by a delicate thread.
Intranuclear chromatin	No chromatin between karyosome and nuclear membrane.	Chromatin grains between karyosome and nuclear membrane.	No chromatin between karyosome and nuclear membrane.
Cytoplasm	Not vacuolated.	Much vacuolated	Many vacuoles.
Inclusions	Red blood corpuscles. No bacteria or crystals	No red blood corpuscles. Bacteria, crystals and other material.	Many bacteria.

CYSTIC STAGE OF DEVELOPMENT, UNSTAINED SPECIMENS

Size	6 to 20 microns. Average 7 to 15 microns.	10 to 22 microns. Average 12 to 18 microns.	8 to 12 microns long by 7 to 10 microns broad.
Shape	Generally spherical. Rarely irregular or oval.	Spherical. Rarely irregular or oval.	Oval or ellipsoidal. Sometimes spherical

CYSTIC STAGE OF DEVELOPMENT, STAINED SPECIMENS

Nuclei, number	1 to 4	1 to 8. Sometimes more, up to 24.	1 to 1.
Nuclei, structure	Like vegetative form but smaller. Delicate membrane, minute central karyosome, no chromatin between membrane and karyosome except the minute grains on membrane.	Like vegetative form but smaller. Thicker membrane with larger grains of chromatin, larger karyosome eccentrically placed and chromatin grains between karyosome and membrane.	Like vegetative form but smaller. Thick nuclear membrane, large divided karyosome and no chromatin between the karyosome and membrane.
Chromidial bodies	Bar, oval or rod like masses with rounded ends. Present in about 50 per cent of cysts.	Filamentous or spicular with square or pointed ends. Present in less than 10 per cent of the cysts.	None present comparable with those of <i>histolytica</i> or <i>coli</i> . Small granular or rod-like masses are rarely observed.

Conclusion.—In view of the results obtained by numerous observers during and since the World War, the importance of infection with *E. histolytica*, and its widespread distribution, has been greatly emphasized, and the recognition of this parasite becomes necessary if the

transmission of this serious form of amoebic infection is to be prevented. The recognition of "carriers" of this parasite is rendered possible by the presence of the cysts, which are the infective stage, in the feces, and a routine examination of the feces should be much more frequently made than it now is in even the best appointed and administered hospitals. The treatment of "carriers" of *E. histolytica* with emetin-bismuth-iodide has resulted in the cure of a considerable proportion of them, estimated by different observers at from 50 to 80 per cent, so that it is possible to render harmless the majority of them if they are discovered. In the military service all mess attendants and food handlers should be examined for cysts of *E. histolytica*, and those found infected should be relieved from further duty of this character and properly treated. All individuals complaining of recurring attacks of diarrhea should also be carefully examined for this parasite, for many such cases are due to infection with this organism. The differentiation of *E. histolytica* is not difficult, after one has had a little practice in observing the common intestinal amoebae of man, and is a perfectly practicable diagnostic procedure which will often result in clearing up obscure cases which have long baffled the clinician. This parasite not only is the cause of amoebic dysentery but it is much more frequently the cause of digestive disturbances and attacks of diarrhea which are usually regarded as being due to some other factor, and patients presenting these symptoms should be examined carefully for possible infection with this species of amoeba.



REMARKS ON COLOR BLINDNESS, TOGETHER WITH SOME OF THE OBJECTIONS FOUND WITH A FEW OF THE COLOR PERCEPTION TESTS NOW IN USE¹

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CONTRARY to the generally accepted idea, color blindness is found both as an acquired and congenital affection. The former accompanies certain diseases of the retina and optic nerve, and is much more frequent than is supposed; the latter is not exactly a disease, but a condition depending upon causes that have thus far baffled science to discover.

Congenital color blindness may present a total inability to distinguish any color whatever, a condition very rarely found, or it may show a defect in color perception so slight as to be discovered only with difficulty, this latter being very common. Between these two extremes an infinite number of degrees of partial color blindness are found; in fact, it is difficult to find two color-blind persons with exactly the same amount and degree of color defect. It is also rather unusual to find a person who is completely color blind to one color without at the same time being more or less deficient in the perception of at least one other color.

It is generally supposed that in total color blindness all colors have a gray appearance and that the loss of perception for any one color results in a gray hue for that color. This may be true provided no other wave lengths are reflected from or transmitted through the color object observed, but as this is generally the case, no one knows with certainty exactly how colors are perceived by the color blind. A person who is red blind sees a dark-red object as nearly black while a light well-saturated red excites in him a visual sensation not unlike that received from a light green. In this way a red-blind individual is often confusing certain shades of red and green but not all shades. The shade of green which is most often confused with red by red-blind people is a blue green, the complementary color of red, and not a pure arsenite of copper green. In connection with this fact, it will be remembered that the green running lights on most of our boats in the Navy have a distinct bluish cast. The above would make it appear that blue would not be a useful color adjunct in the glass used for running lights as it would tend to increase the chance of confusion, but this confusion is not so readily found in transmitted light as in reflected light.

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Partially color-blind people have the sense of detecting differences in luminosity highly trained. This assists materially in avoiding color mistakes. Take a red-blind individual and place before him a bright red and a bright green object of such shades that they appear to him to be the same as far as color is concerned, and in addition arrange it so that the luminosity of each object appears the same to the normal eye, then in spite of this similarity he will, after a little practice, instantly tell which is red and which is green by the difference in luminosity alone, because the relative luminosity of objects as seen by the color blind is so different from that seen by the normal individual. In this case the red object excites very little retinal stimulation in the red blind and looks very dark, perhaps nearly black or of a very dark brownish shade, while the green object excites full retinal value and is seen in its full luminosity, and the difference in luminosities is therefore marked even though it appears practically the same to the normal eye. This rather curious fact is often overlooked in tests for color blindness and explains how some partially or completely color-blind individuals have comparatively little difficulty in distinguishing certain shades of red from green if the luminosity of both test objects is high, but reduce the luminosity, especially that of the green object, to a point so low that it looks like a red object to the color blind, and then he is robbed of the aid that luminosity gives and is compelled to rely on color sense alone, with the result that a confusion of colors is experienced and the color defect is demonstrated.

What is true in regard to those affected with red blindness is also true in a little less degree of the green blind so that in any test for detecting color blindness measures should be devised that will take away, as far as possible, the color blind's greatest aid, luminosity. This fact was taken into consideration in designing an improved color test, a description of which will appear in a future article.

As to acquired color blindness, it is always met with in cases of optic atrophy. In fact, this disease furnishes one of the most frequent causes of disturbed color perception. Here we may expect a loss of visual acuity along with a gradual lessening of the color vision. In this class of cases the loss of the central perception for green is first noticed, followed closely by that for red, and by the time these are gone the loss of perception for yellow and finally for blue is experienced. In some cases of poisoning by chemicals, also not infrequently with persons who use alcohol and tobacco in excess, we find a small central scotoma for colors. If from these latter causes, the loss of color perception is often restored provided the case is properly treated. Almost invariably in acquired color blindness the form vision is also

faulty, which gives us a possible aid in diagnosing the acquired from the congenital type. Occasionally a marked diminution of color perception is experienced for several months, only to clear up finally and leave no traces behind, all apparently without cause. This is an exception, however. As to the pathology of such cases, it is difficult to say. The writer well remembers the case of a young naval officer who noticed that he could not see the red and green lights at night nearly as far away as he was accustomed, but if he came close to the colored lights he could see them perfectly as far as he could judge. There seemed to be nothing to account for this condition and the form vision was not interfered with. After this had lasted for six months he found that he could see colored lights farther and farther away and finally the normal condition was fully restored. This officer had been subjected to the bright sunlight on the water for some weeks prior to this curious phenomenon and this may, in some way not fully understood, have caused the color defect. All this goes to show that acquired color blindness must always be kept in mind when patients are affected with a lack of color perception in any degree whatever.

To demonstrate with accuracy the existence of a color defect in some individuals requires careful and painstaking effort. Not only must the tests employed be such as to assure confidence in the results, but the examiner must be well trained in this line of work to enable him to exercise sound judgment in interpreting the results obtained from the various tests employed.

Color blindness causes no great hardship on any person unless he wishes to take up some calling in which accurate determination of colors is a requisite, such as an employe on a railroad or on a sea-going vessel. Here it must be borne in mind that one must be on the alert for all sorts of tricks and schemes to deceive the examiner, especially by those who know in advance that they have a color defect which might be sufficient to deprive them of obtaining a lifelong occupation. This is noticeably true of applicants for the Naval Service. One of the most frequent methods of surreptitiously passing the color examination is to obtain the test used in advance, then to practice with it until, by the aid of relative luminosities and in other ways, the applicant often is able to slip by a somewhat inattentive examiner. That a color-blind person may enhance his chance of eluding the examiner in this way is true beyond any argument, and it is remarkable what improvement may be obtained by only a brief acquaintance with most of the tests in general use. In devising the improved color test mentioned above this fact has been considered and a scheme worked out by which the applicant under examination can gain a

minimum of advantage even though he has possession of the test and should practice with it long and continuously prior to examination.

The custom of requiring the applicant to name the colors in whatever test he is being examined has evoked a great deal of discussion pro and con. After weighing the arguments presented by both sides the consensus of opinion is that not only is it not necessary to give color names, but it is inadvisable, as the color blind have ways of giving the names correctly though they may not see the color as a normal eye should. An uneducated person will often have either no correct knowledge of the names of the colors, or he will, in his enthusiasm, give more or less fanciful color names that will leave the examiner in the dark as to whether the colors are really seen in their true value or not. The ideal arrangement would be to have a test so simple that it would permit of the application of a rule that the less talking there is on both sides during the examination the more accurate will be the results.

The tests used for detecting color blindness are many. All are probably of use, but some are of decidedly more value than others. No test has ever been devised which satisfies all the objections that can be raised against it. The efficiency of any one test depends in a great measure upon the skill, judgment, and common sense of the examiner.

Two tests much used and well thought of on the Continent, but seldom seen in this country, are the pseudo isochromatic diagrams of Stilling and the cards of Nagel. The former consists of squares of selected colors, so arranged that they form different letters or figures, and the colors are chosen with reference to confusions which are well known to bother ordinary color-blind persons. To this class the squares all look alike, and they are unable to see the letters which are formed by them, thereby demonstrating the lack of color perception. This test would be of far more value if all color-blind individuals presented the same degree of defect, but as this varies greatly this test fails to detect many. The latter test consists of twelve cards on which are presented a number of colored disks arranged in circles. The disks on some cards are all of the same color, but of slightly different shades, while on other cards the usual confusion colors are presented. By requiring the person being examined to select all the disks of the same color, the absence or presence of color blindness is determined. This test is a delicate one and requires not only keen color perception but an active mentality as well in order to give anything like satisfactory results. Both of these tests have many objections, by no means the least of which is that an intelligent color-blind

individual can gain a tremendous advantage if he has the privilege of studying and practicing with them before examination. How advocates of these tests can gain anything like satisfactory results when under the stress of examining a large number of men in a limited time, as is often required, is a mystery. Certainly, for our use in the United States Navy, they would be only of problematical value as a confirmatory test in a few doubtful cases, and only then when the time and patience of the examiner could be utilized ad libitum.

Most of the color tests in general use are mainly qualitative in nature, though a certain amount of quantitative information can be obtained from some of them. A few tests, as that of Wolffberg and Weber, are wholly quantitative. They are based on the principle that a colored object of a definite area can be seen at a certain maximum distance. If the object is of such size that its color can normally be correctly made out at 20 feet and no farther, by a person with average color perception, a 20/20 color vision basis is established, the denominator of the fraction indicating the maximum distance at which the color is to be seen normally and the numerator the distance at which it is actually seen. Thus, if the applicant cannot state the color correctly unless he walks up to within 3 feet of the test object, he would be recorded as having 3/20 perception for that particular color; a scheme of examination not unlike the one now used in the United States Navy to determine quantitatively the form vision. From a practical standpoint the above-mentioned tests are more or less unreliable, as slightly varying conditions of the illumination, together with the frequent differences in brilliancy of the test color, tremendously alter the results of the examination. Even if the examiner had his own test completely standardized under operating conditions, the knowledge thereby gained would be of little value because what we wish to know, in the naval service, is not so much the accurate determination of the quantitative color perception in any case as we do the qualitative perception. Has the applicant under examination normal color vision or not? This is the question we ask ourselves. If not, he would be a menace if placed in responsible positions on ship-board where judgment and action depended in any way upon the correct interpretation of either colored lights at night or colored flags in the day time; in other words, he should be rejected for such occupation if his color vision is below normal.

This brings up the question: What is normal color vision? Both scientific experiment and practical experience teaches us that the realm of normal color vision covers considerable latitude. The minimum might be represented by a person who perhaps has never been

taught the names of colors nor has had occasion in his daily work to observe colors or give such matters any thought, but when placed before reliable tests gives evidence of seeing the primary colors sufficiently accurately to safely warrant his employment in responsible positions where correct determination of colors is necessary. The other extreme of normal vision might well be represented by the person who can actually see violet as a distinct color in the spectrum. It is claimed that not one person in five thousand has sufficiently acute color perception to enable him to do this. Between these two extremes lie many different degrees of proficiency, all of which could properly be considered as coming within the realm of normal color perception. Women in general appear to average higher than men in this matter. Whether their better color perception is because women as a rule use colored materials more than men, or whether it is due to some hereditary influence, science has not enlightened us, but the fact remains. Artists who have used colors for a considerable time become highly proficient and can see shades and tints that are denied to many not so trained. That the delicacy of color perception can be improved by study and practice is true, as the writer well knows, for he can now see red in certain dark purple pigments which formerly were considered as simply blue or indigo.

In testing applicants for the United States Naval Service for color blindness we are not so much concerned with the upper as we are with the lower register of normal color perception. In order to satisfy this requirement we should introduce a quantitative element which might be considered the only quantitative determination necessary in our tests, namely, the establishment of a point or threshold below which it is not safe to accept men for the service. There is no dividing line to mark the transition from normal to defective color sense. All tests leave a wide margin in this respect, and a wider margin is left to the whims and fancies of the various examiners who arbitrarily settle this point as their conscience seems to dictate at the moment. How often have we seen a candidate rejected by one examiner only to be accepted by another and both examiners using similar tests. How often have we seen several examiners constituting a board acting as a sort of a court of appeal, repeatedly examining candidates and finally being considerably in doubt as to whether they were color blind or not. This is explained by the fact that such candidates represent border line cases in the transition from the normal to the abnormal in color perception, and when our tests are most needed to decide these cases they fail and leave us stranded, the decision reverting to the examiner, who is as likely to be wrong as right. As far as color percep-

tion is concerned, a man's acceptance or rejection in the service often depends upon what kind of an examiner he comes before. This should not be so. We should have a test that would give us a minimum of normal color vision below which no one should pass and above which we are perfectly safe to accept. This important point has been considered in a new proposed color test, a description of which will be given at a future time.

A color test which has been used by examiners everywhere and which has for a long time been the official test in the United States Navy is that of Holmgren. More or less recently the leading nations have been gradually discarding this test and substituting others, because it is claimed that the Holmgren test can no longer be considered reliable and that color-blind persons often easily pass the test and that, just as likely as not, many who are not color blind will be rejected by it. Even in the United States most of the railroad companies which formerly relied on this time-honored test now regard it with suspicion and are adopting other and perhaps better means of detecting color blindness.

Therefore it becomes pertinent as to whether we should not carefully consider the advisability of changing the color-perception test now in use in the United States Navy, especially if the Holmgren test is as unreliable as many claim that it is. This question could be more readily answered if something better had already met with universal approval and had generally been recommended by scientists and others who had given much study and thought to this particular field of endeavor. Unfortunately no such agreement has ever been reached, but, on the contrary, a most marked disagreement exists. Not only are scientists all over the world at loggerheads over the physiology of color perception, but they are even more at variance when it comes to agreeing upon an adequate and practical method of detecting defective color perception in any given individual. A description of the method of operating the Holmgren test is unnecessary, as it is generally so well known. Therefore we can proceed at once to consider some of the objections that are raised against it.

In the first place, the colored yarns that comprise the test easily fade. Especially is this noticeable as regards the lighter shades, on which the value of the tests in a great measure depends. This is unquestionably a serious defect and unless a fresh supply of yarns is constantly kept on hand, to replace those that have deteriorated, results obtained by this test might at times be reasonably questioned. Often we have seen the light green and the light rose (purple) skeins so faded that the original color was in doubt. Under these conditions

it could hardly be expected but that the results of the test would be confusing, and this is exactly what happens not infrequently.

In describing his own test, Holmgren states that the dark shades of the colors could have been used equally satisfactorily for the test skeins, but for reasons given he sees fit to use the light green and light rose (purple). Had all dark shades of the test colors been employed, the objection relative to the fading of the yarns would have been largely eliminated.

Another objection to the Holmgren test is that the skeins are so large that cases of central color scotoma are not detected. This is quite true. The London Board of Trade considered it to be of sufficient importance to warrant the necessity of using an associated lantern test by which small areas of colored light could be obtained and viewed from a distance, and as these colored areas would be subtended by the macular region only, any possible error from this source would be eliminated. The writer does not consider this as serious an objection to the test as some would lead us to believe, especially in the United States Navy, where high visual requirements are demanded. Associated with central color scotoma there is nearly always a considerable loss of central acuity for form vision and the applicant would be rejected for lack of ordinary visual acuity before the central color defect, even if present, would be a factor. It is doubtful whether the additional use of a lantern test would be of much aid in eliminating these cases, for the person examined, even if he had a central color defect, would look at the colored lights in the lantern a little eccentrically and frequently be able to name the colors correctly by utilizing his peripheral color perception. The writer once had a candidate under examination who had a small absolute central scotoma which included a defect both for form and color. He could not make out any of the letters at 20 feet on Snellen's card, except the largest letter which he figured out after a while by looking at it obliquely, but he was able to name the colors in a test lantern at 20 feet correctly. When asked how he did it he stated that he looked at the edge of the colored light and then he could make out the color, but if he looked directly at it he could not make it out. In this case he utilized his peripheral color vision to the fullest extent. When a man is in danger of losing a coveted position because of defective color sense it must be expected that he will use all his faculties to enable him to cover up the defect, and the examiner must be on his guard and not rely too much on any color test but to examine carefully into the form vision as well when central or macular color defect is in question.

An important objection to the Holmgren test is that, owing to the

large variety of colors among the yarns presented for examination and the unfamiliarity with the procedure required, the candidate is often confused. This state of confusion is frequently found, and the examiner should be alert to notice it and take time to carefully instruct the candidate so that no misunderstanding will occur. It must be generally admitted that any test which leaves the candidate in doubt as to exactly what is wanted of him in order to carry out the test will operate to introduce an uncertainty as to results and will work to a disadvantage to that extent. When the first skein of yarn that is generally given, one of a pale pure green, is presented to the candidate, and before he fully realizes that it is expected that he will select only those of pure green, he is very likely to select some of the yellow greens and possibly an occasional blue green as well, not because he does not see the pure green properly, but because he sees the green in other skeins and, in his enthusiasm to perform the test well, he includes all skeins that have green in them. Some examiners will reject candidates if they include any yellow greens in their selections, when in reality these are not confusion colors, and the fact that they are included not only does not indicate that the individuals are color defective but rather tends to show the reverse. It might be properly said that such rejections should not be made and that the examiner would be at fault if they did occur. It all goes to show how the candidate may only with difficulty understand what is wanted of him when examined by Holmgren's method, and therefore constitutes a valid objection to the test. Occasionally the candidate will be confused when the rose (purple) test is given out, and the examiner must fully satisfy himself that this part of the test is well understood or he will in a hasty examination conclude that a defect exists when it does not.

The red skein affords little chance for misunderstanding. The greatest chances for confusion are among those candidates who are mentally rather dull and to whom explanations mean little unless they are driven home slowly and in a painstaking way. When one considers the various conditions that exist in a busy recruiting office, together with the carelessness of some examiners and the class of candidates that often come up for examination, it is hardly to be wondered at that the Holmgren test should be a confusing proposition to many. The test to be sought for is one that is so simple and plain that anyone can comprehend it instantly and thereby eliminate all chance of dealing with a confused candidate. The proposed new color-perception test well satisfies this requirement.

That the Holmgren test does not detect those cases of color blindness resulting from a shortening of the red end of the spectrum may

well be considered an additional and important objection. Strange as it may seem, quite a percentage of people cannot make out the color at the extremes of the spectrum as they should, although the intervening colors are all seen normally. This defect is more frequently noticed at the red rather than at the violet end of the spectrum. It is unfortunate that this should be so, for red is universally adopted as a danger signal and it is important that every one should have the ability to discern this color throughout its entire range—that is to say, a range such as is applicable to the so-called normal eye.

It being the very limit of the visual red end of the spectrum that is deficient to a greater or less extent in these cases, we find as a result that it is the darkest shades of red that particularly cause trouble. These shades cannot be distinguished from dark browns or dark greens, whereas the bright reds which appear farther up on the spectrum are correctly seen. This fact may, in a measure, account for the almost total lack of rejections made when using the bright-red test skein in the Holmgren test, although by the rose (purple) test a defect in the red is often at the same time detected.

If a red flag is removed far enough away from the observer it cannot be told from a brown, green, or black flag even by the normal eye, and it is well known that a red light under the most favorable conditions cannot be made out beyond a certain distance. Under unfavorable atmospheric conditions, as in a smoke or fog, a red flag or a red light will look darker than usual, and it will require a keen perception of this color, which then becomes not unlike that found at the extreme red end of the color spectrum, in order to make it out without error. If, at the same time, the individual has a shortened perception for the red end of the spectrum he will be all the less able to discern the red color; that is to say, he will be correspondingly less able to do it than the normal individual should. In detecting these cases the Holmgren test fails, but if the examiner would augment the test as officially described by selecting several dark browns, dark greens, and dark-red skeins, and then ask the candidate to differentiate them, this objection would in a great measure be eliminated, and in this way those defective at the extreme red end of the spectrum would be detected. Unfortunately the Holmgren test yarns have very few real dark-red skeins which can be utilized for this supplementary test and hardly a sufficient number of the dark browns or dark greens to satisfactorily eliminate cases of shortened dark-red perception. The candidate who is defective only in the dark-red end of the spectrum would, in all probability, pass the Holmgren test with ease, and when placed in a responsible position at sea would be at a disadvantage compared with one not so afflicted. A test which will eliminate this chance of error is desired.

Severe criticism of the Holmgren test has been made in that it allows a moderately color-blind individual an excellent opportunity to conceal his defect by comparing the relative luminosities of the test skeins. As previously mentioned in this article, this is an important matter and constitutes a valid objection not alone to this test but to many others. Applicants who are aware that they have a slight color defect frequently procure the test yarns and practice with them and when aided by a keen sense of the relative luminosities of the colors can pass with surprising accuracy. This is especially evident when the test has been hastily conducted. If the examiner will take plenty of time and supplant the usual routine with groups of shades of his own selection, having in mind that it is much more difficult to select colors correctly if the group of yarns from which the selection is to be made are all of about the same luminosity, he may sooner or later catch the applicant off his guard and a marked color defect be demonstrated. In these difficult cases it would be of aid if the examiner had access to several sets of Holmgren's tests which could be combined, thereby giving a far greater assortment of just the shades and luminosities desired. Few examiners have the time and patience to carry the examination thus far. When a slight defect in color perception is finally demonstrated, we are not always certain whether it is sufficient to cause rejection or not; then we are face to face with another objection to the Holmgren test in that it gives us neither a quantitative standard nor a guide by which we can tell whether the candidate is below the minimum normal requirement or not. The decision in this matter is left to the judgment of the examiner and, as previously stated, this judgment varies considerably.

It seems in these border-line cases that opinions of various examiners so differ that it operates to make the candidate's chances of passing the test somewhat of a gamble. A record can be made that the candidate has feeble chromatic sense, but there is nothing to guide us as to whether it is sufficient to cause rejection or not except the opinion of the examiner. The writer well remembers the case of a midshipman at the United States Naval Academy who was passed by the Board of Medical Examiners as being free from color defect. After a few weeks this midshipman was rejected by the same board as being color defective, and then again later on was passed by the same board as having satisfactory color perception. This was simply one of those border-line cases on which the Holmgren test gave no information as to whether the candidate was defective to a degree which should cause rejection or not, and the opinion of the board of examiners simply varied from time to time. There is nothing strange about this, in fact,

it is more strange that it does not occur more often. If we had a test for our own use in the United States Navy which gave us a definite color defect limit below which it would be unsafe to accept a candidate, it would fill a long-felt want.

The London Board of Trade raised the objection that the Holmgren test was too elaborate to be carried out by a person with little or no knowledge of color vision. Most of the medical officers of the United States Navy have received special instruction in the use of this test which, together with considerable experience in its application, should qualify them as experts so that the objection suggested above would not so readily apply in their case. Occasionally we find the test applied in a careless manner, and not infrequently the classical routine is varied considerably by different examiners. Too much latitude is unwise, as the best results are obtained only if the original directions of Holmgren are closely followed.

That too much time is consumed in applying the Holmgren test is often raised as another objection. This depends somewhat upon how much time the examiner has at his disposal. If there are a large number of men to be examined in a limited time a condition is often found, as in a busy recruiting office, where the above objection assumes importance, and in all doubtful cases it does take time to properly conduct this test perhaps more than a test of this kind should. A shorter method, if efficient, would be welcome to medical examiners, and it is believed that this will soon be available.

Before leaving the discussion of the objections to the Holmgren test the writer wishes to state that he is of the opinion that there is much that is good that can be said of it and that, although many valid criticisms can be made, it still stands as a valuable test and is preferable to some that have been devised to take its place. A test that has been used as a standard in the United States Navy for forty years more or less, and with not a serious accident occurring at sea in our Navy during that time which could be attributed to defective color perception as a result of any defect in this test, certainly deserves consideration.

A test based upon Holmgren's theory and like it in having colored yarns to be selected, but differing from it in the method of its application, is that of Jennings. This test has received favorable comment from various sources. However, its value to examiners in the United States Naval Service is somewhat doubtful. In brief, it consists of two shallow square pasteboard boxes with their bottoms joined together but each box having a cover. One box contains a card on which at intervals numerous small colored yarns are fastened, all of which are

greens of various shades or of confusion colors likely to be mistaken by the green blind. On another card placed in the second box the yarns are similarly arranged, but consist only of rose colors or other shades easily mistaken by the red blind. Near each colored yarn is a hole through which the individual under examination inserts a stylus which punches a record sheet placed on the reverse side of each card, thus indicating and recording for future reference the color selected. The whole plan has been ingeniously devised and arranged. A more complete description can be found in the report of the section for ophthalmology of the American Medical Association for 1914. As this test has already been distributed to many medical officers in the United States Navy it might be well to consider certain facts connected with it.

One advantage that the Jennings test has over that of Holmgren is that the colors are not soiled in handling. Also the container is not so large and bulky and the yarns are much smaller, which latter may permit of more accurately designating the central color perception. The self-recording sheet may be an advantage or not, depending upon the point of view, with the argument somewhat in favor of the latter. If a naval medical examiner on the spot is unable to determine whether the candidate is really color blind or not, certainly no "court of review" which has only the record sheet as evidence on which to base an opinion is going to be able to come to any more accurate decision. If the record sheets are to be passed upon elsewhere than at the place of examination, much loss of time, perplexity, and mistakes are sure to follow. Serious confusion will result unless the test-record sheet is placed in each box exactly as directed, and any carelessness in attending to this detail introduces an excellent chance for error. As there are four different ways in which each record sheet can be placed in each box, only one way being correct, it can be seen that not infrequently many sheets are likely to be wrongly inserted, thereby rendering the result of this examination of little value. This test also fails to detect those color defectives who have a shortening of the red end of the spectrum; in fact, it is not even as suitable as Holmgren's test for this purpose. The examiner has no opportunity to group together the darker shades of red, green, and brown in order to demonstrate whether the applicant is defective for dark reds or not, because the colored yarns are fixed on the cards and can not be removed. These yarns are about as likely to fade as those of Holmgren and this, we have already seen, is a serious factor in any test and one of the drawbacks to be considered. The relative luminosity of the test yarns in Jennings' test can be taken advantage of exactly as well as in the Holmgren test, a discussion of which has previously been considered. To us in the Naval Service the

most serious defect of Jennings' test is that any bright moderately color-blind individual will, after a little study and practice with the test, be able to make his selections by memory. Any scheme where the test yarns are in a fixed position readily lends itself to memorization. This objection alone renders the test practically valueless to the naval medical examiner. The writer has also serious doubts concerning the practicability of Jennings' test. This was demonstrated in the following manner:

One hundred persons, representing 20 officers and 80 enlisted men in the United States Navy, all of whom were previously shown to be free from color defect at least to any degree which would be disqualifying for a seafaring life, were each put through the test. The result showed that 31 enlisted men and 9 officers made from one to five mistakes each, and according to the test every one of these individuals would have been a case for rejection. From this it would appear that with Jennings' test we would be in great danger of rejecting a large number of men who had sufficiently normal color perception for all practical purposes. If we were to allow each candidate one mistake for good measure, even then we would have rejected several who were not color blind. When these same officers who had made mistakes were shown their errors they then all easily passed the test correctly, and only 5 of the 31 enlisted men made mistakes after being instructed concerning their previous errors, and 4 of these were credited with only one error. Some of those who performed the test in a rather careless manner seemed to fare better than those who were more deliberate and observed each color carefully before making a selection. There are one or two shades that are most confusing to any person, especially if they have not received instruction concerning these particular shades beforehand. The writer considers Jennings' inferior to Holmgren's for Navy purposes simply because the results of the former are so confusing and so unsatisfactory, especially when memory has any opportunity to play a part, that the examiner is left very much in doubt as to whom to accept or whom to reject.

There are several lanterns on the market for detecting color blindness, each so devised that various colored lights are shown and the candidate under examination being required to name the colors as they are presented. It has been claimed that because a person could not match colored yarns correctly it was no criterion that he could not correctly discern colored lights in their true value. That a test with colored lights is of value in detecting color blindness is true beyond question, but too great reliance must not be placed upon such tests to the exclusion of all others. It must be remembered that at sea a

sailor is often required to correctly see various colors in flags during the day as well as colored lights at night. This fact is often overlooked by zealous devotees of the lantern test.

The efficacy of all lantern tests rests on the ability of the candidate to correctly name the colors. This brings up again the objections regarding color names. Many of the candidates will look at the colored light for some time before giving a name. This takes up valuable time of the examiner, and even then the latter is never certain that the color name given really tallies with the color as seen by the eye under examination. The writer well remembers the case of a midshipman who was reported as being slightly color defective, as was shown by a careful application of the Holmgren test. To further test him out he was examined by the Edridge-Green lantern test, when, to the surprise of everyone, he called all the colored lights shown by a wrong name; that is to say, he would call a red light green and a green light red, a blue light purple, etc. This was confusing until it was found out that he was purposely miscalling the colors, for, as he stated, he had figured it out that if all this fuss was made over his color vision he must be color blind, and if he reversed the color names he would probably hit them right and thus be able to pass the examination. It was later found out that his vision for colored lights was quite accurate.

Of the various lantern tests available, that of Edridge-Green, mentioned above, is unexcelled by any. The writer has used this lantern test for twelve or thirteen years and considers it of special value as a confirmatory test in difficult cases. To give a full description of this test and its proper application would require more space than can be afforded in an article of the kind. In brief, the Edridge-Green lantern has several slides, some holding colored glass disks, others holding modifying glasses by which the appearance of the transmitted colored light may be made to simulate that seen in a fog or rain. Only one color is presented to the candidate at a time, therefore the candidate has no opportunity to compare it with other known colors. The lantern is electrically illuminated and well constructed. In order to obtain satisfactory results with this lantern, the examiner must devote considerable time to the study of the principles involved and learn the value of the various combinations of colored glasses that are used. It is a much more difficult test to understand than Holmgren's, and likewise presents far greater chances for error in results. It is not a test for the novice. If reasonable common sense is not exercised and the directions are not followed, the test can easily be pushed to a point where practically every one would fail. On the other hand, it admirably lends itself to certain refinements of color testing not found in any other

lantern test; for example, colored rays can be absorbed by throwing in certain combinations of colored glasses which would alter the color as observed by the color blind but which would remain the same to the normal eye. A considerable variety of modification of colors can be made by this test which would the more clearly show up the color defects in various varieties of color-blind individuals.

For use in the United States Naval Service a lantern as complex as that of Edridge-Green would only be practicable on stations ashore, and even then only in the hands of trained examiners. In localities where electricity is not available it could not be used. Should the lantern be dropped and the colored glasses be broken, they could not be replaced probably without sending to London. It is also more expensive than some of the simpler tests, and in the hands of the average examiner it is doubtful whether as accurate results would be obtained as are now acquired by the use of Holmgren's test. Edridge-Green has given us a yarn test, also a bead test, for detecting central color defects; the latter is most excellent, and anyone who satisfactorily completes this test certainly has no color disturbance at the fovea.



CHRONIC EMPYEMA¹

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(With twelve illustrations)

IN A PRIOR article² the authors have discussed the subject of acute empyema of the pleural cavity. The present article deals solely with chronic empyema of the pleural cavity, its cause and treatment.

It is by no means easy to define the term "chronic empyema." The time elapsed since initial drainage is no good criterion, for many cases are chronic long before the first operation. The only satisfactory definition is one based upon actual tissue changes. We may therefore define "chronic empyema" as either an undrained abscess or a drained and suppurating abscess cavity, situated within the pleural cavity and surrounded by a relatively avascular wall composed chiefly of fibrous tissue elements. Every chronic empyema has originated as an acute empyema and the fibrous wall which bounds the cavity or sinus represents a definite stage in the pathologic processes affecting the pleurae. The typical reaction of an acute process has subsided, the patient has been able to localize the attack of the infecting organisms to one or more definite points, and these areas are being walled off from the rest of the body by a barrier composed chiefly of fibroblasts and kindred cells. In these chronic cases, however, the empyema has not been completely healed, or the cavity obliterated, before the connective tissue elements have formed not merely a protective barrier but actually a wall—dense, thick, inelastic, unyielding and really helping to maintain the patency of the cavity. It is to be noted that the visceral pleura gives rise to a much thinner, but also a tougher and more rigid layer than does the parietal pleura.

Acute empyema does not of necessity go on to chronicity. With intelligent care from the outset, practically all cases due to infection by pyogenic organisms should be cured before chronicity is established. The factors that predispose to chronicity are three fold: Infection with such organisms as the tubercle bacillus, that give rise to chronic inflammatory processes; low resistance on the part of the patient, due to syphilis, secondary anemia, constitutional disease, or similar cause; and illogical initial care. The last point should be emphasized, and should

¹ Based on lectures delivered to medical officers and pupil nurses at Walter Reed General Hospital, Washington, D. C., during 1919.

² Butler, E. F., and Haverstock, A. D.: "Acute Empyema." *THE MILITARY SURGEON*, April, 1921, Vol. XLVIII, No. 4.

include not only the choice and the time of primary operation but also the detailed post-operative care—by far the most important phase in the treatment of any empyema.

The immediate causes of chronicity are: Infection by tubercle bacillus or similar organism; faulty mechanics of the drainage system; foreign bodies within the cavity or sinus; osteomyelitis of the ribs adjacent to the drainage wound; pleuro-pulmonary communications and residual foci of infection in the walls of the cavity. One or more of these factors will be found in all chronic cases.

The possibility of producing a chronic process, well-nigh impossible to cure, is a strong argument against the indiscriminate employment of open thoracotomy in known tubercular cases.

Unless a cavity empties readily and completely, with the patient in the upright position, there exists a mechanical fault in the drainage system. The commonest faults are a dependent pouch or arm of the cavity below the level of the external wound; a long, narrow sinus separating the cavity proper from the external wound and offering resistance to outflow of the secretions; a diverticulum or secondary pocket. In all these instances there will be more or less retention of secretion, possibly even retention under pressure, and absorption of toxins; bacterial growth will flourish; and neither patient nor surgeon will be able to successfully cope with the condition. For mechanically perfect drainage it is necessary that the drainage wound in the chest wall lead directly into the lowermost part of the cavity, that it be large enough to permit free egress to the secretions, and that there be no diverticula or undrained pockets.

Neither sterility nor obliteration of the cavity or sinus can be secured in the presence of foreign bodies. They include missiles, weapons or other substances introduced by traumatism, drainage or packing material lost in the cavity through carelessness, and sequestered fragments of ribs. Little emphasis has been laid on the last group, but they have been encountered with sufficient frequency in both military and civil practice to deserve much attention. Following the typical subperiosteal resection of rib there remains a portion of the stump denuded of periosteum and open to the action of the infecting organisms. Of necessity it becomes infected and is usually sequestered. If it falls back into the cavity it can only function as a foreign body, and one that is very difficult to locate and eliminate. The surgeon cannot obviate the introduction of foreign bodies by traumatism. Reasonable care, particularly the continuity of ward care, the most important phase in the treatment of any chronic empyema, can obviate the loss of surgical material. The clean elimination by rongeur of all portions of rib stumps

that have been denuded of periosteum will go far to prevent the last group of foreign bodies.

Regardless of the type of drainage operation employed, osteomyelitis of the ribs is always a possibility. Following simple intercostal thoracotomy, pressure necrosis from the drainage tube will eventually open a passage into the medullary cavities of the adjoining ribs. Rib resection opens a direct path for infection of the bone. The resulting osteomyelitis is, in the great majority of cases, a low-grade process, becomes rapidly limited, and quickly clears up. In a small percentage of cases, however, it remains active and the only channel of escape for the secretions is into the sinus draining the empyema cavity. Continual reinfection of that cavity results and will continue until the foci in the ribs have been eliminated.

In an appreciable percentage of cases there exist communications between the air passages of the lung and the empyema cavity. With every respiratory effort infected material will be forced out of the bronchioles into the cavity. Small fistulae, 2 mm. in diameter or less, will care for themselves in course of time; larger fistulae may require surgical intervention before they can be closed.

There remains one last group of cases which are chronic, and remain chronic, though there be no tuberculosis, no general systemic conditions, no drainage faults, no foreign bodies, no active osteomyelitis of the ribs, no bronchial communications. These cases do not heal spontaneously. They resist all efforts to bring about the sterility of the cavity. It seems reasonable to explain the chronicity of these cases as due to a residual infection in the scar tissue lining the cavity. Actually, in some such cases, although not in all, it has been possible to demonstrate by microscopical examination of the tissue miliary abscesses in the walls of the cavity. This can be assumed to indicate a lowered resistance on the part of the patient.

Treatment of chronic empyema must be based on a very careful and thorough history and physical examination, supplemented by X-ray studies and laboratory tests. Only by knowing all the factors directly and indirectly concerned in the chronicity of a given case can the surgeon plan and carry out logical and effective treatment. The history should be particularly thorough in regard to the early period of the empyema. The physical examination should be complete. Special attention should be directed to the respiratory capacity of the affected side, to the cardio-vascular system, to the possibility of pulmonary tuberculosis. A weight chart should be started, and kept up by weekly record. At the very least, two temperature readings should be recorded each day.

Direct examination of the cavity or sinus should yield valuable information. The amount, character, and odor of the secretions should be noted. The location of the external wound with reference to effective drainage in the upright or prone position should be investigated. By probe or rubber catheter some idea can be gained as to the depth and size of the cavity. The probe may be able to locate a foreign body or a necrosed rib. With the patient in such a position that the cavity will readily empty, it can be gently irrigated with small amounts of Dakin's solution. Irritation or coughing will lead to the presumption of pleuropulmonary communications. Tasting the Dakin's solution will practically prove their presence. Naturally, bronchial openings are an absolute contraindication to further irrigation. If no distress is occasioned, the position of the patient can be changed so that the cavity cannot empty, and with great caution it may be filled and the capacity so measured. Capacity determination should be made at weekly intervals and the results charted. Finally, if the external wound be large enough, digital examination may disclose the presence of a foreign body, of a necrosed rib, or of a mechanical fault in the drainage system.

The X-ray study is extremely important. Fluoroscopic examination is valuable, but stereoscopic plates are of far greater value and should form the basis of this phase of the investigation. At the earliest possible moment a set of plates should be secured, to determine the presence or absence of foreign bodies that the patient may have brought with him from other posts. This might settle an important point. Later, when it is known that there are no large bronchial openings, stereoscopic X-ray plates of the injected cavity should be secured. The bismuth cottonseed oil suspension described by Stevens³ has proved extremely satisfactory in this work. First a set of plates are made with the cavity filled, and then a second set immediately after allowing the cavity to empty by gravity. These sets show the absolute contour of the cavity, its relation to the thorax as a whole, its location in regard to apex, diaphragm, mediastinum, lateral wall, anterior wall, and posterior wall. If any mechanical faults exist in the drainage system, they will be demonstrated. The exact location of bronchial fistulae will be shown. Foreign bodies may be brought into prominence by the coating of bismuth left upon them after the cavity has emptied, and some, which might otherwise be transparent to X-ray, shown in that way only. Such plates as are described constitute the very best guides for operative procedure, and should be made as a routine and studied by the surgeon before any large operations are carried out.

³Stevens, F. A.: "The Roentgenologic Study of Empyema Cavities." *Jour. Am. Med. Assoc.*, 1918, Vol. LXXI, No. 24, pp. 1975-1977.

The bacteriological diagnosis should be established by culture of the wound exudate. If the wound is very foul when the case is first received it may be well to eliminate the saprophytic organisms by antiseptic treatment before seeking to determine the specific pathogenic organisms that are responsible for the infection. At all events, the intensity of the infection should be determined and recorded at regular intervals. Two methods are open: the smear method of Carrel or the culture method as described by the authors in a prior paper.⁴ The smear method is the more practical until the intensity of the infection is so diminished that less than one organism may be found per microscopic field. For the determination of a sufficient degree of sterility to permit of closure of the cavity the culture method should be relied upon.

Further routine laboratory tests should include sputum examination for tubercle bacilli, blood Wassermann, complete blood counts to determine the degree of secondary anemia, examination of the twenty-four-hour urine specimen for evidences of nephritis. Any or all of these procedures may disclose pathological processes which must receive attention before a satisfactory result may be anticipated with the empyema itself. Such other laboratory tests as might be indicated by the thorough physical examination should be employed. The cure of a chronic empyema hinges not merely on the local treatment of the cavity itself, but also on the general well being of the patient.

A specimen of the scar tissue lining the cavity may be subjected to pathological examination. This is hardly necessary as a routine procedure, but may be of value in questions of tuberculosis.

In the systematic search for the underlying cause of the chronicity, the physical examination, the X-ray picture, the temperature chart, the weight curve, the sputum examination, and tissue examination will aid in the determination of tuberculosis. Drainage faults will be very clearly demonstrated by the X-ray studies of the injected cavity. Foreign bodies may be proved by probe, digital examination, or X-ray. Osteomyelitis of the ribs may be shown by probe or X-ray. Bronchial communications will be diagnosed during the direct examination of the cavity and can be accurately localized by the X-ray studies of the injected cavity. Residual infection in the cavity walls may be surmised if a perfectly drained cavity, free of tuberculosis, foreign bodies, bronchial communications, or osteomyelitis of the ribs, resists all efforts at sterilization, but can only be proved by pathological examination of a specimen excised from the wall itself.

⁴ Butler, E. F., and Haverstock, A. D.: "Acute Empyema." *THE MILITARY SURGEON*, April, 1921, Vol. XLVIII, No. 4.

Not until the foregoing diagnostic steps are completed, and the cause of the chronicity determined, can the surgeon formulate a rational plan of treatment. From a theoretical standpoint, cure depends on four factors: the elimination of the above-mentioned cause; improvement of the general condition of the patient, thereby raising his powers of resistance and his ability to get well to the highest possible point; the sterilization of the cavity; and, finally, the obliteration of the cavity. Hygiene, medicine, and surgery all play a rôle, but most important of all is to have the control of the patient centralized in one man, qualified in thoracic surgery, and prepared to give the requisite daily attention, which is the *sine qua non* of uniform success in this field of work. Continuity of control and continuity of dressing care are vastly more important than the average man is willing to admit, but the results attained by the "average man" do not entitle him to speak with authority. A second fundamental concept in planning a course of treatment is to exhaust conservative measures before employing radical procedures.

Elimination of the cause of the chronicity is logically the first step to be considered. It may be possible to accomplish it by one decisive step. By a secondary thoracotomy foreign bodies may be removed, drainage made perfect, or necrosed ribs freely excised. A single operative procedure accomplishes the object. The surgeon should allow himself ample room to attain his object; more space is unnecessary.

Bronchial fistulae are not so easy to eliminate. Unless they are situated close to the wound in the chest wall, it will be necessary to make a free opening to expose them. If they are small, say not more than 2 mm. in diameter, they may be treated by direct application of the actual cautery to the opening. One such application may not be sufficient in itself to close the opening. Repeated cauterization at weekly intervals may be employed, and this will necessitate the patency of the wound in the chest wall for the period of treatment. If the fistulous openings are more than 2 mm. in diameter, the fibrous tissue on the lung surface surrounding them should first be excised, so as to mobilize that part of the lung, and then the actual cautery employed as in the first instance. Although anesthesia, local or general, will be required for the exposure of the fistulous openings, subsequent cauterization can be accomplished without an anesthetic, as the periphery of the lung is quite insensitive.

Tuberculosis cannot be eliminated by any one decisive step. Where it exists it is apt to become the controlling factor, and the surgeon may have to realize that local attention to the empyema cavity must be limited to reasonable dressing care, with little or no prospect of cure. Every effort should be made by hygienic and medical care to improve

the general condition of the patient. Radical operations are particularly out of place in these cases, for the patient cannot well withstand operative traumatism, the wounds do not heal rapidly, if at all, and the expectation of life is not sufficient to warrant the risk and discomfort necessarily entailed by the effort to return the patient to an economic status from which the tuberculosis alone will definitely exclude him.

Residual infection in the walls of the cavity can only be eliminated by extensive thoracoplastie operations. It is not fair to undertake such procedures until such a period of observation has elapsed as will serve to prove that there is no other assignable cause for the chronicity. More will be said of these operations when the question of obliteration of the cavity is discussed.

Improvement in the general condition of the patient should be undertaken from two viewpoints: first, the correction of known defects in the individual patient; second, proper attention to the general environment of the whole group of patients.

If the patient has a positive Wassermann, anti-luetic treatment in conjunction with his local care is indicated. A secondary anemia will call for proper medical and dietary supervision, and, if it be of sufficient degree, may call for a blood transfusion. Low resistance to the infecting organisms may be met by blood transfusion, small amounts frequently repeated. If a donor may be selected from a group of convalescent cases that have been able to overcome an infection by the same organisms, the value of the transfusion may be greater. Low resistance may also be met by the use of autogenous vaccines, obtaining the cultures after the cavity has been rendered as sterile as possible by the use of approved antiseptics, thereby eliminating such organisms as have no definite foothold in the tissues. Cardio-vascular or renal disturbances require the proper medical care. It is surprising how rapidly an improvement will be noted in the local condition once active steps are instituted to correct a distant defect.

The general care of these cases is very important. While a chronic empyema does not demand the same forced feeding that is in order in cases of acute empyema, he does require a diet of relatively high caloric content, 3,000 to 3,500 calories per day, selected from easily assimilable food, and so prepared and served as to tempt the appetite. The services of a trained dietitian are desirable. The wards should be equipped for outdoor sleeping whenever practicable. All patients who are physically fit should be required to take setting-up exercises for a period of from fifteen to thirty minutes per day. These exercises should be especially selected with a view to develop the muscles of the shoulder girdle, the chest wall and the back, in order that not only general tone be

maintained but also that faulty posture be corrected and respiratory capacity increased. The use of blow-bottles and similar means to increase expansion of the lungs will not be as effective in the chronic cases as in the acute cases, on account of the dense fibrous tissue binding the lung down. The routine calisthenics will be more effective. Finally, particular attention should be paid to the morale of the patients. Chronic empyema is a distressing condition, cure is tedious and often attended by discomfort and pain, and the patient is restricted in his activities and enjoyments. Every effort that can be made to divert his attention and to provide constructive occupation will help in maintaining a spirit of cheerfulness in the group and willingness to assist the medical personnel in their efforts to cure the cases. "Occupational therapy," under the supervision of trained aides, has proved of great benefit.

Having eliminated, as far as possible, all causes for chronicity, and having taken steps to improve the general condition of the patient, the next logical procedure in the scheme of treatment is to secure the sterility of the cavity or sinus. It is easily conceivable that a patient may, by his own powers of resistance, and by an increasing immunity, overcome the infecting organisms and attain, unaided, the sterilization of a perfectly drained cavity. Very many acute empyemas come to cure in that way. However, the chronic cases have virtually proved their inability so attain autosterilization, and it is more practical to assume that all these cases will require surgical aid if the desired result is to be obtained.

From the standpoint of practical surgery, sterilization implies, not necessarily the destruction of every microorganism, but rather the reduction of the numbers present and the attenuation of the survivors to a point where the host can easily cope with them and prevent their increase in either numbers or virulence. Clinically this is indicated by absence of fever, absence of inflammatory reaction, cessation of purulent discharge, and rapid obliteration of the wound space. Quantitatively it can be determined by counting the number of microorganisms in the exudate, either by the smear method or the culture method, as described by the authors in a previous paper. Let it again be emphasized that in dealing with such a wound as an empyema cavity, which is not open to visual inspection, and which cannot be obliterated by merely closing the drainage wound in the chest wall, that the most delicate method of determining sterility should be employed, namely, the culture count, and that no case should be considered sterile, for purpose of closure, until at least seven consecutive daily cultures have shown no growth after twenty-four hours' incubation.

Sterilization cannot be accomplished in the presence of foreign bodies, bronchial fistulae, or active osteomyelitis of the ribs. It can only rarely be accomplished in the presence of mechanical faults in the drainage system. Hence the necessity of correcting the foregoing faults before attempting to sterilize a cavity.

The direct method of attaining sterility is by vigorous antiseptic treatment of the cavity or sinus. Many antiseptics have been advocated for this purpose—Dakin's solution, dichloramine-T, formalin and glycerine, boric acid, zinc chloride, iodine, and many others. Dakin's solution has apparently given better results and more uniform results than any of the others, and may be considered the antiseptic of choice in chronic empyema.

Before instituting antiseptic treatment it is necessary not only to eliminate the causes of chronicity but to determine that the cavity is amenable to irrigation. Bronchial fistulae are the only absolute contraindications to irrigation. The surgeon should convince himself that there is no fistula before ordering antiseptic treatment. Secondly, the essential requirements for chemical reactions should be appreciated—there must be contact between the reagents, in this case between the antiseptic and the organisms; the contact must be continuous, an antiseptic reacting rapidly must be renewed at frequent intervals, one reacting slowly need not be renewed so often; a sufficient amount must be used to react quantitatively with the other reagent, more antiseptic is indicated in the presence of a massive exudate than in the presence of a small exudate, more antiseptic is required over a large cavity surface than over a small surface. Thirdly, the special chemistry of the selected antiseptic must be known. In the case of Dakin's solution it is necessary to appreciate that its action is rapid, 90 per cent of the chemical energy being expended in five minutes, approximately, and that all traces are lost after from forty-five to ninety minutes. Therefore to have continuous chemical reaction from Dakin's solution provision should be made for its renewal at intervals of not more than two hours, or preferably at hourly intervals. To bring it into contact with all the surfaces of the cavity, the patient should be instructed to assume such a position that the irrigating fluid will pass to the farthest recesses of the tract, and to remain in that position for at least ten minutes, the period of time of the intensive chemical reaction. A sufficient amount of the Dakin's solution up to 100 c.c. should be ordered to completely fill the cavity at each irrigation.

Dakin's solution is strongly proteolytic. Any tissue that is not protected by a serous exudate, rich in protein, with which the antiseptic can react, may suffer from the chemical effect of the "active chlorine."

PLATE I

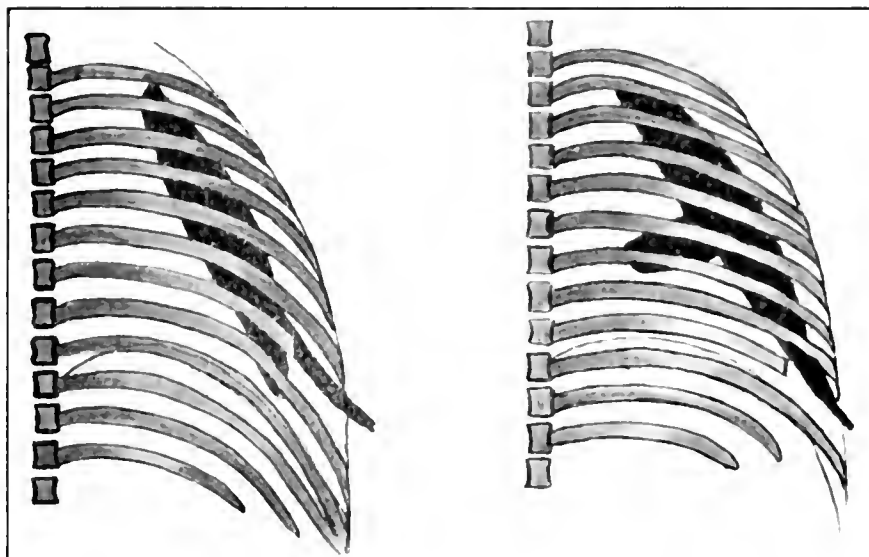


FIG. 1.—Faulty drainage: undrained dependent pouch.

FIG. 2.—Faulty drainage: diverticulum from the main pocket.

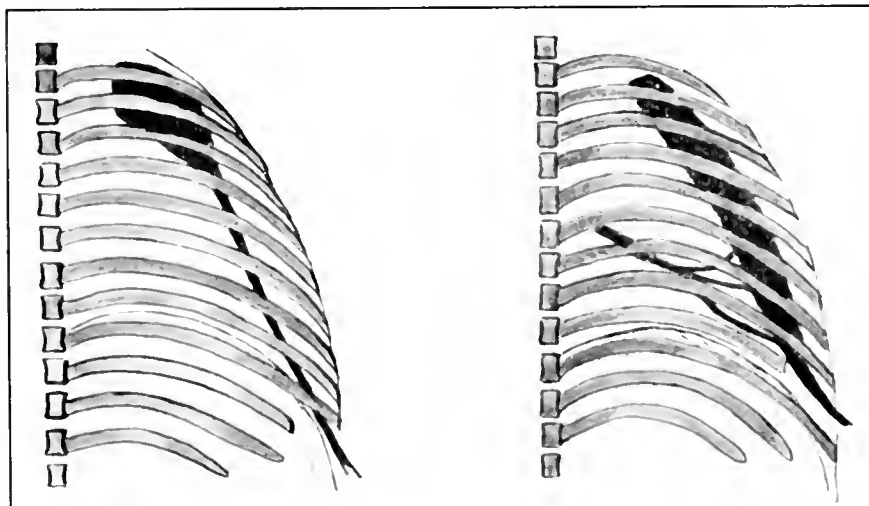


FIG. 3.—Faulty drainage: long, narrow, inadequate sinus.

FIG. 4.—Demonstration of fistulae (smuth injection of cavity).

PLATE I

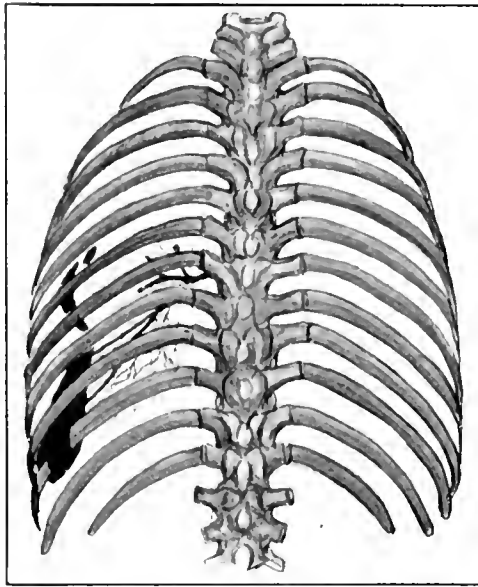


FIG. 1 B. A ray showing bismuth injected cavity with injection of bronchial tree. (Pleuro bronchial fistula).

As the amount of exudate decreases, the amount of the Dakin's should be decreased. If bleeding appears from the empyema cavity, dakinization should be temporarily suspended. A rest of twenty-four hours is usually sufficient to control any capillary oozing.

About 50 per cent of properly prepared chronic empyema cavities can be sterilized by intensive dakinization. As sterility approaches it has been noted that the capacity of the cavity decreases more rapidly.

Once sterility has been attained, as determined by seven consecutive sterile cultures, the external drainage wound may be safely closed. Should it be less than 1 cm. in diameter, it may be allowed to close spontaneously. Should it be larger, it is better to close the wound by formal secondary suture. The latter procedure also allows the muscles to be brought together under the skin scar. Within the chest the cavity still remains until it is gradually obliterated by the patient. During the period of obliteration these cases should be kept under frequent observation.

Obliteration is the final step in the cure of any given case. With no cavity or no sinus there can be no empyema, nor can there be any serious risk of recurrence. Auto-obliteration of the cavity results from four definite mechanical steps: the expansion of the lung, bringing that structure out to the chest wall; the retraction of the chest wall, approximating that structure against the lung; elevation and adherence of the diaphragm, wiping out the costo-phrenic space; and proliferation of scar tissue, filling up the remaining space between lung and chest wall. These steps proceed slowly, commencing coincidently with the initial drainage operation. The less intense the infection, the faster the auto-obliteration proceeds. It is the normal mechanism of cure in the case of the acute empyemas. In chronic empyemas it occurs in a variable percentage of cases, and there are always some cavities that do not obliterate but require surgical measures to wipe them out, otherwise the patient remains as a long-drawn-out chronic case, with all the risk of amyloid degeneration and the other deleterious effects of chronic suppuration.

Surgical obliteration of the cavity by thoracoplastic operation is a serious procedure, and should only be undertaken after all the conservative measures have been exhausted without attaining the desired cure. It should not be undertaken until the surgeon has assured himself that there remains no removable cause for the chronicity; nor until the case has been under competent observation and treatment for a sufficient length of time to demonstrate that there is no further progress, either in gain in weight, decrease of temperature, decrease in the intensity of the infection, decrease in the capacity of the cavity, or other phase

open to quantitative determination. Thoracoplasty is rarely justifiable within a year of the time of the original operation unless the case was an established chronic prior to the initial drainage. It is rarely indicated in the presence of tuberculosis. To decrease the mortality risk the cavity should be rendered as nearly sterile as possible by vigorous antiseptic treatment before operation. Stereoscopic X-ray plates of the injected cavity should be made and carefully studied, in order that the surgeon may gain a clearer idea of the relations of the cavity and may plan his operation more logically.

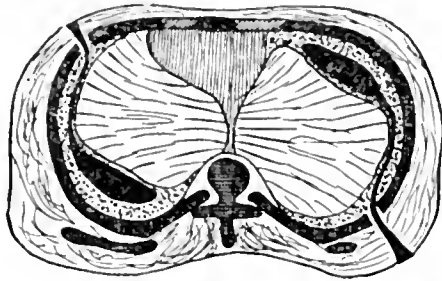


FIG. 5.—Faulty drainage; transthoracic drainage.

There are four main types of thoracoplastic operation. They are founded on one or more of the mechanical steps of auto-obliteration. They are all severe operations. No type is free from appreciable mortality risk, and none is attended by a 100 per cent assurance of success. Often the object can be accomplished in one operative step, but sometimes the surgeon must anticipate several stages before the whole procedure is completed. From an anatomical and physiological standpoint some types are very conservative, sacrificing few structures and saving nearly all of the respiratory capacity; other types are quite radical, sacrificing much of the chest wall and of the respiratory capacity.

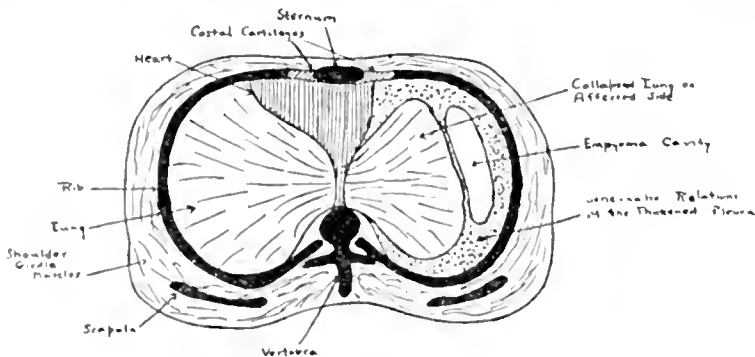
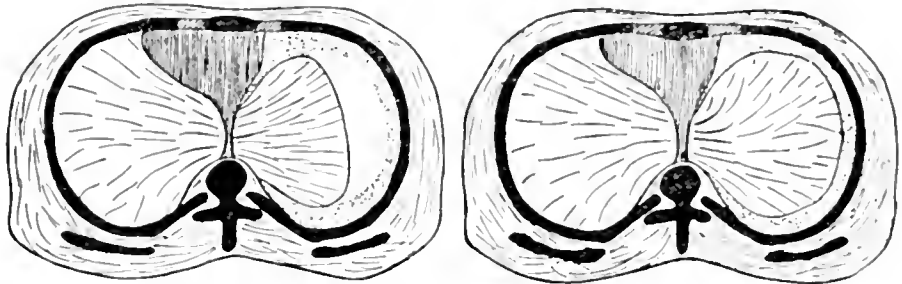


FIG. 6.

The most conservative type of operation is the decortication, as described by Fowler⁵ and Delorme.⁶ Theoretically, if the limiting membrane that binds the lung down can be removed, then the lung will reexpand and approximately normal respiratory capacity be regained. At the same time, all the structures of the chest wall are preserved intact. Occasionally, especially in streptococcus cases, it is nearly impossible to peel off this membrane. It may then be split, down to lung surface, by criss-cross incisions, and the lung partially liberated in that way. No effort can be made in this paper to describe the details of this or other thoracoplastic operations; it is only possible to briefly review the types and the fundamental principles underlying them.

FIG. 7.—Type I. Thoracoplasty.



Operative steps: Decortication. Excision of visceral layer and visceroparietal angle, liberating the lung.

Desired result: Expansion of lung and obliteration of the cavity with increased respiratory capacity

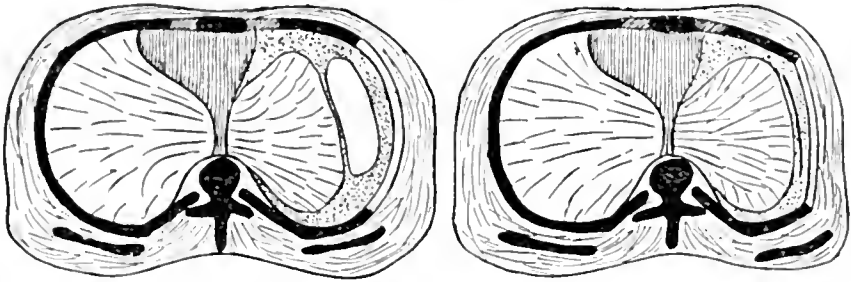
In the first type, effort is made to bring the lung out to the chest wall. In the second type of operation effort is made to bring the chest wall down to the surface of the lung. The bony framework, or ribs, prevents the chest wall from collapsing and renders it comparatively immobile. In this type the ribs constitute the point of attack. By subperiosteal resection the ribs overlying the cavity may be removed, taking out the dome of the arch, so to speak, and allowing the flaccid wall to fall down against the lung surface (see diagram, Type II-a). Another option is to remove, by subperiosteal resection, segments of rib along the anterior and the posterior borders of the ribs and, to preserve the simile of the arch, thereby shorten the piers and allow the dome to descend (see diagram, Type II-b). Anatomically, nothing is lost but ribs which may be subsequently regenerated from the periosteal sheaths that remain behind, but physiologically there is a permanent

⁵ Fowler, G. R.: "A Case of Thoracoplasty for the Removal of a Large Cicatricial Fibrous Growth from the Interior of the Chest, the Result of an Old Empyema." *Med. Rec.*, 1893, XLIV, 838-839.

⁶ Delorme, E.: "Nouveau traitement des empyèmes chroniques." *Gaz. d. Hop.*, 1891, LXXII, 94-96.

reduction in the respiratory capacity. Surgically it is easy to accomplish, but is attended by serious risk of infection of the operative field, for even though the cavity itself may not be opened, the intimate association of the parietal pleura and the inner layer of the periosteum predicates a residual infection in the latter tissue which is often stirred to activity by the traumatism occasioned by stripping it from the rib. This is particularly true in old streptococcus cases, and it is these very cases that afford the great majority of thoracoplasties.

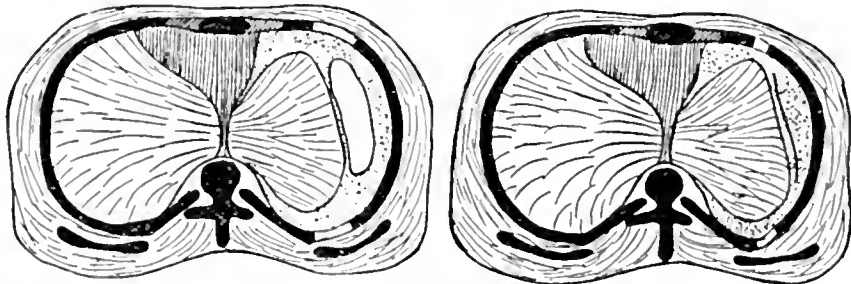
FIG. 8.—Type II-A. Thoracoplasty.



Operative steps: Subperiosteal resection of ribs overlying the cavity.

Desired result: Collapse of the chest wall, thereby obliterating the cavity.

FIG. 9.—Type II-B. Thoracoplasty.



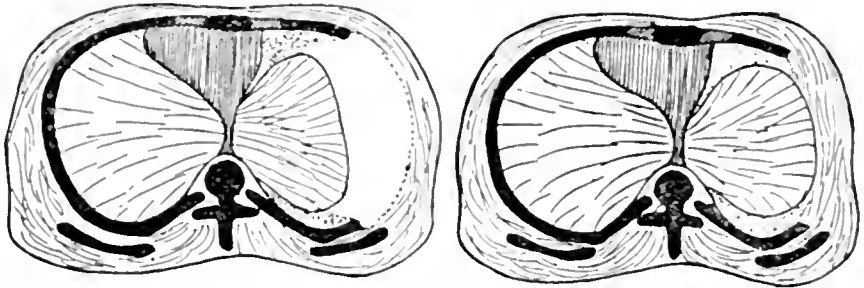
Operative steps: Subperiosteal resection of anterior and posterior segments of ribs overlying the cavity.

Desired result: Collapse of the chest wall, thereby obliterating the cavity.

The third type of thoracoplasty is the removal, *en masse*, of the entire chest wall overlying the cavity—ribs, periosteal sheaths, intercostal muscles, intercostal nerves and vessels, and the greatly thickened parietal pleura. Of necessity the cavity is opened and complete decortication may be accomplished at the same time. In the closure of the wound the shoulder girdle muscles are utilized to reform the thoracic wall. Anatomically and physiologically it is a radical procedure, for many structures are permanently sacrificed, and the respiratory

capacity is seriously diminished. On the other hand, it enables the complete removal of all the bacteria-bearing tissue. On account of the wide opening of the cavity the mortality risk will depend to a great extent on the degree of infection within the cavity. The operation should be preceded by vigorous antiseptic treatment.

FIG. 10.—Type III. Thoracoplasty.

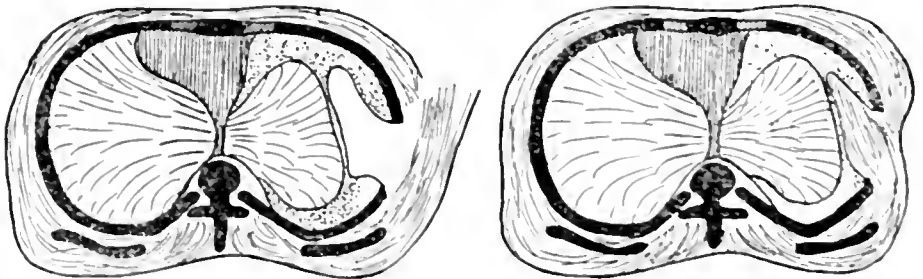


Operative steps: Complete excision of ribs, periosteal sheaths, intercostal structures, and thickened pleura.

Desired results: Combined expansion of lung and collapse of chest wall, with obliteration of cavity.

In the fourth type, effort is made to obliterate the cavity by filling it with either a viable or a nonviable substance. The introduction of a nonviable substance, no matter what the intent may be or what the nature of the substance may be, can only be regarded as the introduction of a foreign body into the cavity, and is an illogical procedure. Viable substances include masses of muscle and skin and muscle flaps. However, it is very difficult to make even a pedicled flap adhere to and derive nourishment from an infected surface, and ingenious though the idea may be, there are physiological and mechanical difficulties that preclude a great expectation of success.

FIG. 11.—Type IV. Thoracoplasty.



Operative steps: Resection of chest wall as in type III, and preparation of a muscle flap for filling the cavity.

Desired result: Transplantation of muscle flap into the cavity and obliteration.

In selecting the type of thoracoplasty for any given case it is well to utilize the operation that will give the best ultimate physiological result. Decortication, accomplished through a wide intercostal incision, is the most conservative. Failing to succeed in that attempt, some operation that will eliminate the maximum amount of bacteria-bearing tissue is the next best expedient. The surgeon should be prepared to follow any thoracoplasty by a blood transfusion. The operations may be long, and the condition of the patient none too good. Donors should be secured and typed before the operation is undertaken, in order that there be no delay in securing the benefits of the transfusion.

In summarizing, the following points must be emphasized: Every case of chronic empyema presents an individual problem. While there are certain common and frequently encountered causes of chronicity, the exact factors operative in any particular case must be determined by careful, detailed study of the patient. Wherever possible, the causes of chronicity must be eliminated before proceeding further with the treatment of the patient. Throughout the course of treatment the responsible surgeon should maintain continuity of control over each individual patient. The general well-being of the patients should receive adequate attention. Every effort should be made to attain the ultimate object by conservative measures and without recourse to radical procedures. Vigorous antiseptic treatment of all properly prepared cavities should be carried out in the effort to cure by sterilization. A cavity that cannot be sterilized should be obliterated surgically rather than allowed to remain as a chronic focus of suppuration.



PROTECTION AFFORDED BY ANTI-PNEUMOCOCCUS VACCINATION AGAINST RESPIRATORY INFECTIONS

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THE problem presented to the medical officers of the army in 1917, when it was foreseen that undoubtedly the respiratory infections in this war would take the place held by the enteric diseases during the Spanish-American War, stimulated interest in the various forms of vaccine against the great respiratory infection, pneumonia.

Sir Almroth Wright, in 1911 and 1912, began a large series of experiments relating to this problem, but this was before the division of the pneumococci into types or groups, and so the results were not of great value in determining the potency of the vaccine used.

Lister, in South Africa, following his classification of the pneumococci encountered there, developed a saline vaccine, using large numbers (6,000 billions) of each of these groups. He inoculated large numbers of highly susceptible natives with this vaccine. They were kept separated from immune carriers until protection developed and then followed for a period lasting over a year. His reports showed evident success, and these have since been confirmed by subsequent work along the same lines.

The vaccine used in South Africa was prepared from organisms grown on nutrient broth, separated from this medium by means of the super-centrifuge, and resuspended in sterile saline solution.

During 1917 and 1918 this problem was studied in various parts of the United States. At the Army Medical School, under the direction of the Director of Laboratories, several vaccines were prepared. After much animal and human experimentation, a lipo vaccine, similar to one then being used by the French, was decided upon. This vaccine contained 10 billion each of the fixed types of pneumococci suspended in 1 c.c. of sterile oil.

After preliminary trials on large groups of volunteers this vaccine was distributed to the troops of the A. E. F. and the United States for voluntary inoculation. Civilian institutions desiring to use this vaccine were supplied with it free of cost; they, in turn, promising to keep records and to supply the Surgeon General's office with these when called upon. Requests were made for reports of all cases of pneumonia developing in the vaccinated, showing types of organism, length of time after vaccination, and termination of illness.

The reports returned seemed to indicate that the vaccine had a protective value, but they were far too meager to justify a positive statement as to the exact worth of such a vaccine as a prophylactic agent.

During the fall of 1918 it was decided to try experimental vaccination upon about 50 per cent of the men at Camp Upton. These men were mostly city dwellers and supposedly highly immune. A saline vaccine prepared in a manner similar to that of Lister was made under the direction of Maj. J. H. Austin. The dosage was as follows: Types I and II, 6 to 9 billion and Type III, 4.5 to 6 billion in each c.c. Four doses were given in the majority of cases.

The immediate results of the experiment were highly gratifying. The final figures showed the development of seventeen cases of pneumonia of all types among the 12,519 vaccinated men, as against 173 cases of pneumonia of all types among the 20,000 controls. These figures were gathered during a period of about ten weeks following vaccination. At this time the men were sent overseas, distributed among various organizations, and further detailed study was prevented.

Later in 1919, at Camp Wheeler, where there were about 16,000 recruits from rural districts, mostly negroes, Major Cecil conducted an experiment, inoculating about 13,000 with lipo vaccine prepared at the Army Medical School. The remaining number, about 3,000, were used as controls. During the experiment the camp was under close quarantine so that the conditions for study were extremely favorable. These troops were under observation about three months, during which period there were thirty-two cases of types I, II, and III pneumonia among the 13,000 vaccinated men as against forty-two cases of the same types of pneumonia among the 3,000 unvaccinated.

While the figures in the two experiments cited showed evidence of protection, the period of observation, owing to the necessary movement of troops, was too short for formation of definite conclusions as to the potency of the vaccine used.

Following the armistice the manufacture of a prophylactic pneumococcus vaccine was studied at the Army Medical School under the direction of Maj. H. J. Nichols. Various vaccines prepared in different manners were tested experimentally, and in 1920 a vaccine, now known as the triple pneumococcus broth vaccine, was developed. This vaccine is prepared as follows: The culture medium used is beef infusion broth ph. 7.8 prepared from fat-free ground beef, containing 1 per cent of Armour's peptone and 0.5 per cent NaCl. The completed broth is put up in 2-liter flasks, each flask containing $1\frac{1}{2}$ liters of broth. The flasks are sterilized for one hour at 15 pounds pressure. Upon removal from

the sterilizer they are cooled and then placed in the incubator for twenty-four hours. At the end of this period the sterility is tested, and if satisfactory the batch of broth is passed.

The cultures of pneumococcus used were obtained from the United States Public Health Service, and are kept at a virulence of one to one million for mice. Before use in vaccine transplants are made and purity proven. Young, rapidly growing transplants on plain beef infusion broth are used. The monovalent vaccines are made separately and on different days, so as to avoid any confusion.

Just before a monovalent vaccine is to be planted the flasks of beef infusion broth are opened and a sufficient amount of sterile $33\frac{1}{3}$ per cent glucose solution is added to make the final dilution 0.1 per cent. The flasks are thoroughly shaken and 10 c.c. of the culture of pneumococcus added. The flasks are placed in the incubator at 38° C. for fifteen hours. Upon removal from the incubator the flasks are opened under sterile conditions and a small amount removed from each flask to be later used for determining the count of the vaccine and for testing the purity.

The flasks are placed in the killing bath and allowed to remain for one hour at 53° after this temperature has been reached. During the killing process, the determination of the count is made and the purity of the growth tested by Gram staining and agglutination.

Any contaminated flasks are discarded and the remaining flasks are pooled in 2-gallon glass containers, sufficient trikresolized sterile salt solution being added to make the final dilution of the monovalent vaccine, 4,000,000,000 pneumococci per c.c. Determination of the amount of trikresol added is made so that the final concentration is 0.25 per cent.

The pooled lots of monovalent vaccine are allowed to stand for one hour, at the end of which time they are cultured anaerobically and aerobically. These cultures are incubated for seventy-two hours, and if sterile at the end of that period, the pooled monovalent vaccine is released for mixing.

Equal amounts of the three monovalent vaccines are mixed and bottled in 2-gallon bottles. Each bottle is tested anaerobically and aerobically and the cultures incubated as above. If these cultures are found sterile, the completed vaccine is released for ampouling. Samples of each type of ampoul filled from each bottle used are tested in a manner similar to the testing of the monovalent and mixed vaccines. If sterile the vaccine is released subject to the reports on the animal inoculation tests.

One rabbit, one guinea-pig, and one mouse are inoculated intraperi-

toneally with 1 c.c. of the mixed vaccine; and one rabbit, one guinea-pig, and one mouse inoculated with 1 c.c. subcutaneously. These animals are observed for one week. When the animal reports are negative the vaccine is released for issue.

The reactions obtained from this vaccine were extremely mild. Several thousand doses were given during January and February, 1920, but the results, while favorable, were not conclusive. Observations on the pneumococcus vaccine problem by Fletcher, Cecil, and Blake led the Surgeon General's office to seek definite data on this subject in order to try to definitely settle the question of prophylactic inoculation in the Army.

The divisional camps and large permanent posts seemed to offer a favorable field for work on this problem. During November and December, 1920, 445 white soldiers from Camp Meade, Maryland, all volunteers, were vaccinated with the triple pneumococcus broth vaccine. The uninoculated in the same organization were taken as controls. These numbered 1,874. Following the inoculation of volunteers at Camp Meade a similar experiment was started at Fort Myer. This being a large, permanent post, it was thought that a comparison might be drawn between troops in the divisional camps and those in permanent quarters at posts.

At Fort Myer, at this time, there were one squadron, four troops, of the 3d Cavalry, and one battalion, four batteries, of the 19th Field Artillery. The experimental inoculation was begun the first week in January and completed in three weeks. The troops and batteries occupied brick barracks, all located on the same street. Alternate troops and batteries were chosen, and practically all the men in the selected organizations volunteered. These vaccinated men and controls have been under observation since January, and compilation of the data will be made and published at a future date.

At Camp Meade both inoculated and uninoculated were kept under observation from January 1, 1921, to April 15, 1921. All admissions to the hospital for all respiratory diseases were noted. The vaccinated and controls were in two separate organizations, the 41st Infantry and the Tank Corps. Of these there were vaccinated 190, with 233 controls in the 41st Infantry, and 255 vaccinated with 1,641 controls in the Tank Corps. Summaries of the results obtained in these two organizations are given in Tables I and II.

TABLE I

Summary of Results in the 41st Infantry

Average strength of the command.....	423
Total number vaccinated.....	190

Total number controls.....	233
Incidence rate pneumonia, both groups.....	0
Percentage of respiratory diseases among vaccinated.....	10.5
Percentage of respiratory diseases among controls.....	14.5

TABLE II

Summary of Results in the Tank Corps

Average strength of the command.....	1,896
Total number vaccinated.....	255
Total number controls.....	1,641
Incidence rate of pneumonia among vaccinated.....	0
Per cent of incidence rate of pneumonia among controls ¹	0.06
Percentage of respiratory diseases among vaccinated.....	8.60
Percentage of respiratory diseases among controls.....	9.67

The soldiers in both groups lived essentially under the same conditions, in cantonment barracks, all performing the usual routine duties of soldiers during peace times, such as guard duty, drill, shop work, etc.

In this study we had in mind not only the effect of the vaccination on pneumonia, due to the three fixed types of pneumococci, but also the protecting influence against the other acute respiratory diseases. This secondary result of antipneumococcus vaccination was first observed by Wright in his work among the native mine workers in South Africa, 1911 to 1913.

The incidence of the various acute respiratory diseases among the two organizations is shown in Tables III and IV.

TABLE III

Incidence of Respiratory Diseases in the 41st Infantry

	Total number soldiers	Morbidity	Pharyngitis acute	Tonsillitis acute	Rhinitis	Bronchitis acute	Influenza	Measles	Pneumonia	Otitis Media	Percentage admissions
Vaccinated.....	190	20	3	9	1	4	1	1	0	1	10.5
Controls.....	233	34	7	20	0	4	2	0	0	1	14.5

It will be noted that the total morbidity among the controls is thirty-four as compared with twenty among the vaccinated, or a difference of 4 per cent admission rate. This difference is due principally to the increased number of cases of acute tonsillitis in the control group.

¹One case pneumonia following measles, not typed

TABLE IV
Incidence of Respiratory Diseases in the Tank Corps

	Total number soldiers	Morbidity	Pharyngitis acute	Tonsillitis acute	Rhinitis	Bronchitis acute	Influenza	Measles	Pneumonia	Otitis Media	Percentage admissions
Vaccinated	255	22	0	10	0	9	2	1	0	0	8.6
Controls	1641	149	24	75	4	25	4	12	1	4	9.67

In the Tank Corps, as in the 41st Infantry, the difference in the admission rate is due principally to the incidence of acute tonsillitis, plus the difference in pharyngitis.

In this last group of 2,319 individuals observed during the period from January 1, 1921, to April 15, 1921, only one case of pneumonia developed. Therefore this study in itself does not add any information to the subject of protection by vaccination against pneumonia due to the fixed types of pneumococci. However, it does seem to show that anti-pneumococcus vaccination has some beneficial effect on reducing the incidence of other acute respiratory diseases, although the numbers are too few and the difference too small to warrant any definite conclusions.

A similar observation was made by Wright in 1911 to 1913. Among 10,426 natives in 1911, none of whom were vaccinated, the incidence rate of "other" diseases was 31 per cent; in 1912 among 12,549 natives, of whom about 50 per cent were vaccinated, this rate was cut to 20.7 per cent; while in 1913, among 15,234 natives, of whom about 92 per cent were vaccinated, this rate was further reduced to 14.4 per cent.

This difference in the incidence rate of respiratory diseases among the vaccinated and controls may be explained either by the protection afforded against slight respiratory infections caused by or aided by the presence of the fixed types of pneumococci in the upper respiratory tract, or by the non-specific increase in resistance of the mucous membrane from vaccination.

While we expect to continue the study of prophylactic vaccination against pneumonia with a view to securing more conclusive data concerning its efficacy, we feel that one or all of the three larger camps should be selected for this work. This will obviate the necessity of securing this data by carrying out numerous small experiments at army posts and independent stations.

CONCLUSIONS

The figures in the present study are too meager to warrant definite conclusions, but they do seem to indicate that prophylactic antipneumococcus vaccination with a polyvalent broth vaccine confers some degree of immunity against infections of the upper respiratory tract.

The reports of antipneumococcus vaccination, since the work by Wright in 1911, all point to favorable results in the protection afforded against pneumonia caused by the fixed types of pneumococci. However, more experiments along the lines mentioned above must be carried out before a definite status can be given this procedure in the field of preventive medicine.

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FOUR CENTURIES IN THE TREATMENT OF SYPHILIS¹

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ORIGIN OF SYPHILIS

ACCORDING to the work of Thomas Rangonius (1508), the great epidemic of syphilis first appeared in Galacia, Spain, and was therefore named "Morbus Galecum." It raged throughout Spain in 1494, and in the same year the whole of Italy was affected. In 1495 France, Germany, and Switzerland became the sites of virulent outbreaks; Holland and Greece in 1496, England and Scotland in 1497, Russia and Hungary in 1499. The disease was first recognized in India after the arrival of the crews of Vasco da Gama (Portuguese) at Calicut in 1498. In China, according to U-Pin (1550), syphilis broke out in epidemic form in Canton in 1505 as the result of the visit of a European trader.

Opinion has favored the theory that syphilis was introduced into the Old World by Christopher Columbus on his return from America. Its spread over Europe was facilitated by the armies of Charles VIII of France, made up of mercenaries from many countries, including Spain, both during its invasion of Italy in 1494 and after its disbandment in 1495. It is probable that Columbus was the first to introduce syphilis into the Old World, or he may have introduced merely a new and virulent strain.

THERAPY OF THE EARLY PERIOD

Syphilis had probably been known in Espanola (Haiti) from time immemorial. At the time of the arrival of Columbus the Indians were already in possession of a highly complicated, rationally developed and deduced method of cure of this ailment, the details of which Diaz de Isla learned in the year 1504 from a translation. This consisted chiefly in treatment by guaiacum and other vegetable drugs, in conjunction with hydro-therapeutic, dietetic and climatic methods of treatment.

The first manifestations of the great epidemic of syphilis of the fifteenth century were not treated at all, having been a complete surprise to the physicians of that period. It was considered disgraceful for a practitioner to occupy himself with such a disease. This was mainly due to their complete ignorance of a disease unknown to Hippocrates, Galen or Avicenna. It was treated by druggists, herbalists, and imposters of all kinds. The abuse was so great that at last physicians became ashamed of neglecting their duty and undertook the treatment

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of the scourge. This consisted at first in diet, hygiene, bleeding, laxatives, juices of herbs, together with baths, sweating and various kinds of ointments.

Mercury came into use very early. Introduced into therapeutics by the Arabian physicians Rhazes, Avicenna, and Mesue, it was employed in the treatment of various cutaneous affections. Analogy naturally led to its employment for syphilitic eruptions. Various forms of mercurial ointments were proposed by different physicians as early as 1497, especially by Berengario da Carpi and Jean de Vigo. In a satirical poem by G. Samarissa, of Verona, mention is made of the use of mercury in 1496. At the very first the effects of this agent were dreaded and the doses given were small, but the dosages used rapidly increased, together with excessive and repeated inunctions until the remedy became worse than the disease. This method of treatment then fell into discredit, to which the importation of guaiacum from Haiti (1508-1517) further contributed. From that time dates the famous discussion of the advantages and disadvantages of the mercurial preparations.

Mercury was at first used externally only. There were four ways of using it, says Astruc: As a plaster or cerate, as a wash, as an ointment or inunction, and in perfumes (fumigation). About the year 1533 Pietro Andrea Mattioli first ventured to give mercury internally administered in the form of red precipitate. Following discoveries in chemistry, many different forms were administered, but regrettable excesses in dosage were committed. Convinced that salivation was necessary as a price of health, and was the only means of eliminating the poison of the disease, they sought above all things to produce it. It was not until the first part of the eighteenth century (Chicoyneau, 1718) that an effort was made to demonstrate the inutility of salivation in the treatment by mercury, but this reform did not triumph for many years.

Guaiacum was known in Spain as early as 1508, and according to Delgado reached Italy and Germany about 1517. It then came into rapid general use. It was used as an infusion in various strengths, combined with a strict diet. Among other sudorific woods in popular use were holy wood from India, and cinchona, introduced into Europe about this time (1536-37). Then came the use of sarsaparilla, sassafras, canella bark, saponaria, bittersweet, germander, hyssop, citron, oranges, and lemons. However, the sudorific woods and plants soon lost much of their reputation, and by 1564 Fracanziani states that many clever physicians had been obliged to have recourse again to mercurial inunction. In the seventeenth century guaiacum was

still in use, but the physicians of the eighteenth century, with few exceptions, abandoned it almost completely and had recourse to mercury. Astruc declared, like many others, that the sudorific woods were incapable of curing any but local and commencing venereal diseases.

The identity of the different venereal diseases and the modes of attack and characteristics of syphilis were fairly well determined by scientific study on the part of numerous workers of this period, including Fernel (1496-1558), Gabriele Fallopio (1523-1562), Ambroise Paré (1510-1590), Gregory Horst (1575-1636), Lancisi (1654-1720), and Jean Astruc (1684-1766). The publication in 1736 of Jean Astruc's classical work, "*De Morbis Veneris*," constitutes a landmark in the history of syphilis. He contributed little, but brought together all the existing knowledge of the subject.

THE HUNTERIAN PERIOD

The culminating point in the period of retrogression in the scientific knowledge of syphilitic affections is probably occupied by John Hunter, who, inoculating himself with the pus from virulent gonorrhea, produced a chancre as well as constitutional syphilis, from which he concluded that the virus of all three diseases, gonorrhea, chancre, and syphilis, was identical.

In regard to treatment, Hunter says: "As the three forms of venereal infection—gonorrhea, chancre, and the lues venerea—all arise from the same poison, it would be natural to expect that one medicine, whatever it would be, would cure all forms of this disease. But we find from experience that this does not hold good, for one medicine—that is, mercury—cures only the chancre and the lues venerea, and the gonorrhea is not in the best affected by it; and what is still more remarkable is that the two which it cures are in no respect similar, while the gonorrhea, which it does not cure, is similar in some respects to the chancre, which it does cure.

"If there is such a thing as a specific, mercury is one for the venereal disease in two of its forms. Yet mankind are in pursuit of other specifics for the disease, as if specifics were more common than diseases; while at the same time they are too often contented with the common mode of treating many other diseases for which they have no specific" (1).

The history of syphilis from Hunter's time (1728-1793) was one, first of confusion, then of gradual groping for the light.

In a work written in 1661 Simon Pauli gives an account of the cure of a case of syphilis by the use of opium, but it was not until near the end of the eighteenth century that opium acquired all at once a certain popularity in the treatment of the disease and came into use in

massive doses. About the same time oxygenized substances came into wide but transient use. The treatment without mercury, so popular in the first quarter of the nineteenth century, was due probably to the failure to differentiate between various venereal diseases, following the ideas of Balfour, Hunter, Adams, and Carmichael. It was soon followed by a return to the general recognition of mercury, along with the better differentiation of venereal diseases and the disproving of the Hunterian theories.

MODERN SYPHILIS

The history of modern syphilis begins with Philippe Ricord (1799-1889), the great experimenter and pioneer in genito-urinary diseases. He disproved John Hunter's theories, worked out the three stages of syphilis, emphasized the differentiation between hard and soft chancre, and helped prove the contagiousness of secondary syphilis. He, with his pupils and followers, established the fundamental part, and the larger part, of our present knowledge of syphilis.

In therapeutic lines Ricord is the founder of the French school of mercury by mouth medication. He preferred the use of proto-iodide pills, and says of their use: "The most powerful way of action is by way of the intestinal canal, the application by the skin is far inferior and ought only to be employed when the bad state of health of the digestive organs will not allow the direct introduction of the medication" (2).

Iodine and its compounds had not long entered the domain of therapeutics when they were employed for the cure of syphilis. Inspired by the practice of Gertanner, who gave burnt sponge for venereal ulcers of the throat, Martin, of Lubeck, conceived in 1821 the idea of substituting iodine for the sponge and obtained good results from it. Wallace, of Dublin (1834), has the honor of having been the first to employ iodide of potassium, to fix its dosage, and to point out the indications for its use. He thereby definitely introduced iodine into the therapeutics of syphilis and placed it almost on a level with mercury.

The idea of the so-called "syphilization," promulgated by Diday (1812-1894), was essentially the cure of syphilis by repeated inoculations of the same infected person with syphilitic virus until immunity was produced. It was studied by many workers, who failed to obtain any therapeutically valuable results. These studies, however, resulted in the knowledge that the products of syphilis are only rarely inoculable upon the patient or upon other syphilitic individuals.

The influence of Ricord gave rise to two great French schools of syphilology—those of Diday and of Fournier. It was largely through the work of these great syphilographers and their disciples that the

clinical knowledge of syphilis has been brought to its present state. Diday gave his attention to the problems of congenital syphilis, while the work of Fournier ranged over the whole field of syphilis, and he was probably the greatest clinical syphilographer that the world has produced.

Fournier advised that the treatment of syphilis be carried out "with truly active and curative doses of mercury and potassium iodide, the duration of treatment not to fall below three or four years however benign the original diathesis may have been." This he considered the necessary minimum, not, as he says, to cure the disease but to avert its dangerous manifestations both for the present and for the future. In addition he advised a course of iodide treatment every two or three years to keep the disease in check and to hold the ground gained (3).

DEVELOPMENTS OF THE TWENTIETH CENTURY

The most astounding advance in the diagnosis and treatment of syphilis came with the scientific discoveries of the early twentieth century. Metchnikoff and Roux in 1903 succeeded in transmitting syphilis to monkeys. On March 3, 1905, Fritz Schaudinn discovered the origin of syphilis in one of the protozoa, the *Spirochæta pallida*. In 1906 Wassermann applied the Bordet-Gengou phenomenon of complement fixation to the diagnosis of syphilis. The commanding intelligence of Ehrlich applied ideas of chemotherapy, with the startling result, salvarsan, in 1909 (4).

The ingenious suggestions of Swift-Ellis on the use of the intraspinal salvarsanized serum and the finding of *Spirochæta pallida* in paretic brain tissue by Noguchi and Moore became known in 1912. The knowledge of the colloidal gold reaction, obtained from the ideas of Thomas Graham concerning colloids and developed by Szigmondi, was effectively applied by Lange in 1913.

Until the discovery of the *Spirochæta pallida*, there were two opinions as to when to begin the general treatment of syphilis. In one the specific therapy was begun as soon as possible after the recognition of the primary affection; in the other it was believed necessary to wait until the appearance of the secondary symptoms. This latter view was held by the majority, because they believed that the action of mercury was more lasting in the general syphilitic stage, that it had never been possible to arrest the disease by early treatment, and, above all, that it was impossible to make an absolute diagnosis before the roseola appeared. This hesitation in diagnosis, however, has disappeared with the discovery of the *Spirochæta pallida* and the Wassermann reaction. Hoffman was able to prove that the blood

from syphilitic patients taken two weeks before the appearance of the general eruption induced syphilis in apes. Neisser proved by inoculation experiments that the internal organs of apes contained syphilitic virus at the time of the appearance of the primary lesion and often much earlier. It is therefore necessary to begin the general treatment as soon as syphilitic infection has been proven by the presence of the *Spirochata pallida*.

Unfortunately the great expectations of salvarsan, as a result of the first enthusiastic and favorable report of Alt, Weichselmann and others, were only partly fulfilled. It was soon learned that Ehrlich's arsenic preparation did not effect a complete cure in the sense he anticipated, and certainly this end cannot be obtained and should not be expected in such a chronic and complicated disease as human syphilis. Armed with the laboratory aids to diagnosis and the addition of salvarsan and its allied preparations, we have, then, to see what the last ten years have brought forth regarding the therapeutic management of syphilis.

PRESENT STANDARDS IN THE THERAPY OF EARLY SYPHILIS

Realizing that the hope of a radical cure of syphilis by a few injections of salvarsan was impossible, and yet recognizing its extreme value in the treatment of syphilis, many methods and systems of treatment have been advocated. Time already has proven many of these inadequate or dangerous. When it is realized that salvarsan has been in general use in the treatment of a disease so chronic and complicated for only ten years, it is easy to see that many years of observation of treated cases and large numbers of well-kept records with each of the systems now in use will be necessary before any standard of treatment can be universally adopted. In this paper an endeavor has been made to bring together some of the various methods of treatment as advised by physicians of wide experience. Abortive treatment and that of early syphilis only have been considered, as the general subject is too large to cover in a paper of this nature.

At the present time the temperate opinion of the world recognizes that the prompt eradication of syphilis by specific treatment is only likely to be successful in the early weeks of the disease. If the disease is recognized within the first ten days after the appearance of the chancre, vigorous treatment then begun has an excellent prospect of aborting it. This prospect rapidly diminishes after the first ten days, and after the disease has become systemic to the point of producing the secondary eruptions, the prospect of quick cure by specific treatment with salvarsan and mercury has almost vanished.

MERCURY

The moderate systemic and temperate use of mercury developed under the French school, led by Dupuytren, Ricord, and Fournier, and by Jonathan Hutchinson in England. The intensive methods of administering mercury in vogue at the present time, by inunction and particularly by injection, are due to the insistence of the modern German school.

Three types of treatment with mercury have obtained general recognition—the continuous, the symptomatic, and the intermittent forms. The intermittent treatment, now the most widely accepted method, alternates the periods of intensive therapy with periods of rest. Certain considerations in regard to the physiological or toxic effect of mercury on the blood, kidneys, gastrointestinal tract, mouth and teeth seem to make the intermittent form the most rational.

When administering mercury by mouth the various preparations are probably of value in the following relative order: Mercury with chalk, bichloride of mercury, and the protoiodide and biniodide of mercury. There can be little question but that the efficiently applied inunction is the best available method for the administration of mercury in syphilis and has the advantage that it is not cumulative. When using mercury by injection the employment of the soluble salts has the advantage of fixed dosage, rapid availability, and ease of control of the toxic symptoms should they arise. They have, however, to be administered at daily or at the most short intervals, which constitutes their main objection. The insoluble salts are administered at intervals of from five days to one week, but they are distinctly cumulative, and their absorption is slow. The studies of Schamberg, Kolmer, and Raiziss show that at the end of six or seven weeks almost 50 per cent of the mercury may remain unabsorbed at the site of injection and that weekly administration leads to cumulation of the drug in the tissues. For rapid effect with little cumulative action, therefore, soluble salts are to be recommended (5).

IODIDES IN THE TREATMENT OF SYPHILIS

The iodides do not apparently affect the organism of syphilis and for that reason should not be regarded in any sense as a substitute for mercury or salvarsan. Their function is that of promoting lysis and absorption of granulomatous and newly formed fibrous tissue, whose development is one of the pathological changes induced by the presence of the *Spirochæta pallida* in the body. The administration of iodides may, in general, be begun in the early secondary stage of syphilis in order to combat the fibroses from the very beginning. In order to

prevent meningeal irritation and neuro-recurrences, Pinkus recommends large doses of potassium iodide in secondary syphilis, accompanied by involvement of the central nervous system. The most striking results are apparent, however, in the treatment of gummatous infiltration and have no place in this paper. It should invariably be administered in conjunction with mercury, whose germicidal action upon isolated spirochaetes is aided by the breaking down and absorption of infiltrates.

SALVARSAN

Several preparations with essentially the same base are now in use: Old salvarsan or arsphenamine, neosalvarsan or neoarsphenamine, sodium salvarsan, and silver salvarsan. Of the relative values of salvarsan and neosalvarsan much has been written and each has its champions. According to the results of experimental studies of Schamberg, Kolmer, and Raiziss, 0.6 gram arsphenamine equals 1.05 grams of neoarsphenamine in therapeutic activity, and they consider 1 gram of neoarsphenamine to have a greater margin of safety than 0.6 gram arsphenamine, although the latter has a trypanocidal activity 1.74 times greater than neoarsphenamine (6). Much work has been done recently with the latest preparation, silver salvarsan. It is reported less toxic, is used in smaller dosage, and is more soluble than the older salvarsan, and is seemingly as effective, but the few cases of argyria that have been reported following its use have led most men to be skeptical of it.

When salvarsan was first introduced injections of the neutralized drug were made subcutaneously, but the frequent occurrence of sloughs and the painfulness of this method led to its being abandoned. Deep intramuscular administration was then substituted, and it still has occasional advocates, such as Wechselmann, Eiche, and Sutton. On the whole, however, both experimentally and practically, the intramuscular injection has proven to be less satisfactory than the intravenous.

In general, the average adult subject should receive no more than 0.3 gram of old or of neosalvarsan at the first injection. One week between injections is the usually accepted interval, although Sicard, Pollitzer, Ormsby and others shorten this interval even to one day, and Neisser insists on ten days between the larger doses. The average dose of salvarsan after the second or third is, according to Fordyce, Wechselmann, Tomaszewski, and Neisser, between 0.2 and 0.5 gram. Gennerich employs somewhat larger doses. Kromeyer thinks the single dose of salvarsan should not exceed 0.4 gram. Leredde, who believes salvarsan capable of curing syphilis without the use of mercury, employs doses of neosalvarsan as large as 1.2 grams at the end of a

course. Dreyfus urges high total dosage amounting to even 5 or 6 grams in a period of six to eight weeks. Such large dosage is, however, losing instead of gaining favor. The general practice now among conservative workers is to use 2 to 3 decigrams for the initial dose with 4 and at a maximum 6 decigrams for subsequent weekly doses (4).

THE ABORTIVE TREATMENT IN EARLY SYPHILIS

The possibilities of aborting a syphilitic infection is a conspicuous therapeutic advance which we owe to salvarsan. Many cases after a thorough course of abortive treatment fail to evidence the slightest sign of the disease after the most searching clinical and serological investigations. The strongest evidence in the favor of the possibility of an abortive cure is the fact now often observed of reinfection.

A certain percentage of the cases of reinfection undoubtedly represents local recurrences, and another group may perhaps be interpreted as superinfections. The literature now contains many reported cases of evidently bona fide reinfections by such men as Hoffmann, White (twenty-eight cases), Spangenthal, Goubeau, Levin, Kermorgant, Klaunder, and many others. Reported cases should fulfill the following requirements: The *Spirochata pallida* should have been found in both attacks, with a positive Wassermann reaction during the first infection and a negative reaction early during the second. Jacobi, in an article on reinfection and curability of syphilis, states that the question "Is syphilis curable?" cannot be answered definitely in the light of our present knowledge, the occurrence of reinfection in syphilis must be accepted as an established fact, and that reinfection is by no means evidence of curability (7).

The first essential to an attempt at abortive cure is a prompt diagnosis of the primary lesion. Wherever syphilis can be recognized in the primary stage by the demonstration of the *Spirochata pallida*, abortive cure should be attempted. The prospects of success are brightest when the Wassermann reaction is still negative, so that not a day must be lost in instituting treatment. Levy-Bing and Gerbay (8) discovered that the Bordet-Wassermann reaction appeared always after a certain interval following infection. If abortive treatment is pushed before this interval has terminated, it has every prospect of success, but after the expiration of this period treatment may retard the appearance of a positive Wassermann reaction but does not prevent its becoming positive sooner or later. This interval is thirty-seven days in length. It is followed by a period of eight days, in which the outcome is dubious; after the forty-fifth day no treatment will

ward off a positive reaction. Hence they conclude that effective abortive treatment cannot be expected after the thirty-seventh day.

Abortive treatment should not be undertaken in individuals in whom the use of arsphenamine or the most intensive employment of mercury is contraindicated. An examination of the urine, blood pressure and cardiovascular system should invariably precede the first injection.

The technique of abortive treatment as employed by clinicians of large experience varies noticeably. Most of these workers now employ courses of treatment over a longer period than that which they formerly considered sufficient and believe it is a better policy to err on the side of over rather than of under treatment. A few of the systems used by these various workers will be considered in this paper. Those in use for abortive cure and in the treatment of early syphilis are essentially the same. As we have no criterion for absolute cure except time, and as the best results are obtained by early treatment, most syphilographers are recommending repeated courses of treatment given frequently early in the disease. It is also well to recognize the value of Gennerich's postulate and restrict the rest interval to six weeks or less in order to prevent a Wassermann relapse.

Neisser (9) and Wechselmann (10) announced their systems of treatment in 1913. Neisser used two courses of combined salvarsan and mercury, and Wechselmann depended on neosalvarsan alone, giving eleven injections in ten weeks. Hoffman (11), Leredde (12), and Gennerich (13) announced their systems in 1914. Hoffman employed five injections of salvarsan, followed by a course of mercurial inunctions. Leredde used neosalvarsan alone in doses from 0.15 to 1.2 grams, employing three courses with a three-week rest interval. Gennerich differentiated between early cases with negative and with positive Wassermann reactions, using one course of salvarsan combined with mercury in the former, and two courses in the latter. In later cases treatment consists of three courses or more, depending upon the serological findings.

Fordyce recommends giving a course of five to six injections at intervals of one to two weeks in average doses of 0.4 gram, together with twenty to thirty injections of a soluble salt of mercury at one to two-day intervals, or twelve injections of an insoluble salt at weekly intervals. Two such courses are usually given. He emphasizes that the first course is probably the all-important one (14).

The treatment recommended for the French Army in 1916 was designed to render the soldier fit to return to his unit as quickly as possible and plans to complete his cure after his return to duty. To

this end eight intravenous injections of neoarsphenamine are administered in increasing doses at intervals of six days, the patient being in a hospital. In addition to this forty-two injections of a soluble mercurial salt or fifty inunctions are administered. At the end of this course, which lasts seven weeks, the patient returns to duty and one month later commences protoiodide of mercury pills by mouth, taking them during the first ten days of each month for a year (15).

The minimum course prescribed in 1917 by L. W. Harrison at the military hospital, Rochester Row, London, for average early cases of syphilis in the British Army is as follows: Three doses of 0.3 gram of salvarsan on the first, fourth, and eighth days; 0.4 gram on the twenty-second; 0.5 gram on the twenty-ninth, forty-third, and fiftieth days; and eight injections of mercurial cream at weekly intervals. On the fifty-second day a Wassermann test is made, and if it is not completely negative, potassium iodide is given for two weeks, followed by a course of three weekly injections of salvarsan of 0.3, 0.4, and 0.5 gram, respectively, and three injections of mercurial cream. If the blood is still positive, a series of short courses is prescribed similar to the last three injections of the first course. He states that it would probably be better to give a complete course even if the case were negative on the fifty-second day (15).

A system of standard treatment for syphilis was devised by Young for the American Expeditionary Forces and is a very commendable one. It comprises, as a minimum, four courses of treatment in a little over one year. The first course consists of eight injections of neoarsphenamine in graded dosage from 0.3 to 0.9 gram. The first three injections are given at four-day intervals and the rest at weekly intervals. A soluble salt (cyanide of mercury) is employed at the start, and then the insoluble gray oil is substituted. The first course is followed by a thirty-day rest interval, at the end of which a Wassermann reaction on the blood and a complete serological examination of the spinal fluid is made. Regardless of serological results, a second course, which consists of five weekly injections of neoarsphenamine in graded dosage from 0.45 to 0.9 gram, combined with five injections of gray oil, is instituted. Two more courses are given, regardless of the Wassermann reports, at a ten-week and a three-month interval. Following the fourth course a four-month rest interval is allowed, and if the blood Wassermann and spinal fluid are then serologically negative, no further treatment is given, but the patient is checked up serologically and clinically at the end of a four or five-month rest period (16).

In his book on syphilis, Hazen advises eight injections of arsphenamine, the first four injections at three to five-day intervals and the last

four injections at weekly intervals accompanied by a course of mercury. A second course of four arsphenamine injections followed by another course of mercury is given (17).

Habermann and Sinn believe that patients who have passed the negative phase of primary syphilis are best treated by two or three courses of arsphenamine and mercury. A single course, even if the Wassermann reaction becomes negative, is not sufficient, and the patient is not entirely cured, as proven by the occurrence of relapse syndromes. A course consists of from eight to ten injections of neo-arsphenamine, beginning with 0.3 gram and ascending to 0.6 gram at intervals of five to seven days. Mercurial injections are used in combination with the above course. A period of from six to eight weeks constitutes the rest interval (18).

Finger advocates in primary syphilis prior to the Wassermann positive period treatment consisting of thirty inunctions and five to six moderate doses of salvarsan. Once the Wassermann reaction is positive, even if no secondary symptoms are apparent, the case is considered as one of secondary syphilis, and treatment consists of repeated courses of arsphenamine and mercury at intervals of three or, at the most, four months (19).

Leven protests against the dogmatic statement that cases of sero-negative primary syphilis can be aborted by a single course of treatment and cites cases to prove his point (20).

Pollitzer employs a system of treatment based on the principles of intermittent sterilization and prolonged saturation. His course of arsphenamine consists of an intravenous injection of a full dose (0.1 gram for each 25 pounds body weight) of arsphenamine on each of three successive days. His course of combined treatment consists of a course of arsphenamine followed by a four to six-week course of mercury by injection. Four courses of combined treatment should be given during the first year after infection, irrespective of the Wassermann reaction, having six and eight weeks' rest interval, respectively, between courses. Further treatment in early cases is called for or not according to the results in the individual case (21). It will be noticed that this system is slightly more prolonged than as originally announced in 1916.

In the early stage before generalization has occurred Ormsby recommends three injections of arsphenamine, given on alternate days. The average dose is 0.4 gram. The first dose is never more than 0.2 gram. Following this course, treatment with mercury either by injection or inunction is given for one month. Six weeks from the last arsphenamine injection three more injections are given. After the

second series of arsphenamine injections, mercury is employed for three months, followed by a third series of arsphenamine, and mercury again for three months. In the second year two series of treatment are given in Wassermann negative cases as prophylactic. In Wassermann positive cases the procedure is as outlined in the first year (22).

The system of treating early syphilis in use by Stokes at the Mayo Clinic, with whom the writer has had the opportunity of being associated as an acting fellow during the past four months, probably covers a longer period of time, with more elaborate checks on the patient's condition, than any of the methods outlined. The results are in the process of compilation. The result in regard to the reversal of the Wasserman reaction is at least as good as any that has been published, and there have been no neuro-recurrences in early cases noted. The system consists essentially of arsphenamine administered in four courses of eight, six, and six injections, respectively, having an initial dosage of 0.3 gram and a final dosage of 0.4 to 0.5 gram, with an interval between the courses which should not exceed six weeks; and mercury administered in three courses of eighty inunctions each during the first year, which are given so as to overlap the arsphenamine administered until the third course is begun. Not less than 300 inunctions of 4 grams of mercury should be given during the entire treatment. If specially indicated, an examination of the cerebrospinal fluid is made at the time of the second and sixth injection of each course, otherwise the examination is made as routine with the second injection only. At the completion of the treatment the patient is directed to return for observation at the end of forty-two weeks, after which time he is to return at intervals of from four to six or eight months for four and one-half years, and yearly thereafter for a decade or longer as determined by conditions and circumstances.

CONCLUSIONS

Over four centuries in the treatment of syphilis with mercury failed to develop any satisfactory standard of treatment. More than ten years' experience in modern methods of treatment has likewise failed to bring us much nearer this goal. But advances have been made in this direction. At least the use of arsenicals and mercurials in association, with few exceptions, comprises the basis of modern systems of treatment. Time and observation of treated cases only will determine the mode of application, dosage, number of courses, and the length of periods of rest best applicable for cure.

It is recognized that many syphilographers refrain from announcing a system of treatment, realizing that more is necessary than the simple 1-2-3 steps of system in piloting a given case to cure. It requires a thorough knowledge of the disease, a technical and therapeutic knowl-

edge of methods of treatment, and the handling of complications that cannot be incorporated in a simple standard of treatment. Yet the writer strongly favors the adoption of some standard of treatment, at least for early cases of syphilis, in the United States Navy. There are several reasons for the adoption of such a standard.

The service would benefit in the establishment of a standard for treatment whereby cases could be checked up and followed through a set course of treatment, barring complications, with less danger to the patient and more promise of cure than where various standards are followed in the same case.

More satisfaction among our patients would be produced by a standard treatment, and a better spirit of cooperation would be secured if they were not given various treatments according to the special leanings of different medical officers.

Our records would be unified so that statistics could be compiled on a large number of treated and observed cases that would be, in future years, of the utmost value in determining the value of such a standard and of present methods of treatment.

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Original articles, items of news and matter of interest to the Service are welcomed. Requests for reprints should be made at the time of forwarding articles.

ARMISTICE DAY

On the eleventh of the month we are to observe the day which marked the cessation of the strife which convulsed the world for four weary and anxious years, and, following the example of our allies, do honor to those nameless ones who were blotted out of life and recognition by the ruthless force of war.

There are perhaps three opinions as to the proper attitude in respect to this ceremony. A very cynical and perhaps socialistic one is exemplified in a recent writing by Mr. Coningsby Dawson in the October issue of *Good Housekeeping*. Mr. Dawson, who is a Canadian by birth and who played a gallant part in the war with the British forces, is quite sure in his own mind that the ceremonies accorded by Great Britain to the representative of their unknown dead, the burial of this unrecognized soldier in the Abbey, is a piece of tawdry sentimentalism, a belated and futile effort to accord to the private soldier the things which should have been his while he was still a sentient being, a modest cog in the scheme of things. He brings the abstract to the concrete and imagines what "Old Charley" would think if he could rise from his coffin and realize the unwonted honors being paid him.

This egoistic standpoint instead of the altruistic one seems to us unfortunate and to savor rather of narrow mindedness, or at least of a somewhat soured disposition. It was to no one individual that these last honors were paid, but to all those who by reason of the resistless force of war were barred from any individual honor as those who had definitely existed. In laying this poor clay to rest in Westminster, England buried there the unidentified son of every woman of the kingdom. If for no other reason than this, it seems as though it might have been worth while. His plea that more honor should have been accorded Thomas Atkins during his life seems hardly warranted. In the wretched, materialistic business of modern war the private soldier

takes on much the same aspect as the humbler class in time of peace. Who sings the glory of those who dig ditches, hew the wood or draw the water? And yet, is it not quite well, if tacitly understood that they are essential in the scheme of things, and that what they accomplish is as requisite to progress as is the work accomplished by the head instead of the hands?

As the world is largely maintained by those who toil in humble capacity, so are armies made up primarily of privates and not of colonels and generals. The fact seems so self-evident that Mr. Dawson's complaint appears to fail for lack of proper grounding. To those who were recognizable after the swift death of war had overtaken them it was possible to erect some memorial. These mangled remains which once had been individual men must ever stand in a category alone and apart, and it seems to us that, far from being a case of belated tribute, this ceremony in London and throughout the United Kingdom was a gracious tribute not only to those whom it was not possible to recognize in any other way, but also a matter of comfort to the families which mourned them. Mr. Dawson in all his writings deplores war as do most men—certainly those who saw as much of it as he did, but it would not seem that this is sufficient ground for so much bitterness against the recognition of the spirit which actuated these unknown soldiers to give the supreme gift for the state to which they owed their allegiance.

As to the other two opinions to which we referred: should this day with its attendant ceremonies be looked on as a day of mourning? Perhaps so, if it is war which we deplore and international strife. Certainly not if it is the spirit which prompts men to go forth and give their lives for what they consider a righteous cause. After all, the certain end of all men is death, and the presumptive finish of the fighting man is extinction on the field of combat. It is what he must expect to find when he takes up the guerdon for his country. That the fates snap the thread of his life in this manner rather than in that which befalls in times of peace is, after all, but the chance of existence, and surely an honorable death in defense of one's country can no more be deplored, *per se*, than the fatal and protracted end of an illness. Death is death in whatever guise it overtakes us, and while it is inevitable that we should miss those who go, there must be some mitigation in accordance with the circumstances which attend it. If it is true that "*Dulce et decorum est pro patria mori*," our sorrow should be tinged with satisfaction in view of what has been gained for mankind by the price paid. Individualism must be merged in the common good and personal sentiment reconciled with national need.

And so it seems to us that the Eleventh of November should not

be for us, with its attendant solemn ceremony, a day of mourning, but rather one of congratulation that there were men who were not afraid to go forth in the defense of right and to give for it all that they had. Further, we are inclined to believe that this unknown soldier of ours whom we are to honor on that day would, if he were able to voice his feelings, disagree with the somewhat cynical forecast of Mr. Dawson as attributed to the British soldier who was buried in Westminster Abbey. We believe that he, like Ortheris in one of Mr. Kipling's inimitable tales of the "Soldiers Three," would agree that it is not the man's part to talk of "his rights," but that he would view what he had done as a duty well concluded for the nation's sake.

JAMES ROBB CHURCH.

WHY NOT REPORT IT?

Once or twice in the past we have suggested to the membership of the Association that they were in large part the editors of *THE MILITARY SURGEON*. Without cooperation of those who make up this membership it is neither possible nor practicable to put out an interesting and worthwhile publication. It is a perfectly simple matter to take it for granted that some other than yourself will furnish the copy which you read in the monthly issue, but if this practice were in general effect it would mean a sad scarcity in the pages devoted to original contributions.

With a membership as large as ours it is hardly conceivable that there should not be many interesting things which could be set forth in the official publication. Why there is so much modesty, or laziness, the editor is at a loss to understand. We cannot undertake to fill the entire quota of reading pages, and we have no illusions as to the fate of the magazine if we did so. We reserve the right to cultivate, in whatever manner we see fit, the small editorial garden which is allotted to us, but beyond those bounds we are loath to step. No special invitation is necessary to secure recognition. That which is of common interest is what we wish to print, and the plea of lack of literary ability can hardly hold good in this matter of technical writing. Clear description in moderately decent English is within the power and scope of practically anyone who has intelligence enough to successfully carry on the practice of medicine. Therefore, we, the editor, suggest that you, the membership in general, take on yourselves the task of supplying the material which is the essence of being for *THE MILITARY SURGEON*: facts, theories, case reports, results of operations, any one of the many things which may be and are of interest to all of us. And finally, and by way of reiteration, we again invite attention to the fact that, willing though we be, we cannot do it all alone.

ASSOCIATION NOTES

At a meeting of the Executive Council of The Association of Military Surgeons, October 3, 1921, the following names were proposed and elected to membership in the Association:

Medical Corps, U. S. Army

Lieutenant Colonel

William Jason Mixter

Captain

Clyde Yeager Beard

Medical Reserve Corps, U. S. Army

Majors

Frederick John Cullen

John Jones Goodwill

Captain

Ewing Taylor

Medical Corps, U. S. Navy

Captain

Charles Norman Fiske

Commanders

Louis W. Bishop

James M. Minter

Medical Corps, U. S. N. R. F.

Lieutenant

Myron Gilmore Wright

Medical Corps, Alabama National Guard

Captain

George Eason Blue

United States Public Health Service

Surgeons

Charles Stanislaus Capelle

Mather H. Neill

Frank L. Williams

Passed Assistant Surgeons

Robert Louis Allen

Walter Alvin Black

William Leander Moore

Edmund A. Munoz

Assistant Surgeon

Myron J. Hahn, Jr.

Acting Assistant Surgeons

Marcus Lunsford Dillon

William Carey Verdery

Attending Specialists

Millard Fillmore Arbuckle

Casper H. Benson

Carl Boardman

Albert E. Hubbard

REINSTATEMENT

Medical Reserve Corps, U. S. Army

Major

John M. Henderson

COMMENT AND CRITICISM

NEW REGULATIONS FOR OFFICERS' RESERVE CORPS¹

This article comprises extracts from the new series of regulations which in the future will govern the appointment, assignment, and promotion of members of the Officers' Reserve Corps. Only such paragraphs as are of special interest to the officers of the Reserve Corps are published herewith. The work of making the Officers' Reserve Corps of the Army of the United States an efficient organization existing not only on paper but as an actual working body is occupying the serious attention of the War Department. The Secretary of War and the General of the Army consider this body one of the most valuable assets of national defense, the individual members of which will be of incalculable aid in developing the new military policy of the nation.

APPOINTMENT

12. The Officers' Reserve Corps is established for the purpose of providing a reserve of officers available for military service when needed. It is not a separate component of the Army, but is the corps which furnishes the necessary reserve officers for assignment to all components of the Army of the United States. Its members will therefore normally be assigned or attached to authorized organizations of the Army of the United States in time of peace. The number of reserve officers assigned or attached to organizations of the Organized Reserves in time of peace will not be limited to the strict requirements of tables of organization, but will include the officers required for replacement and for the formation of such new and additional units as may be required after the initial mobilization. Appointment as a reserve officer is not, in any case, to be the mere conferring of a rank, but is made to fill an office in which service may be rendered. Appointments are not honorary or rewards for past service, but are based primarily upon the qualifications of the appointee to satisfactorily perform the duties of a particular office.

13. In view of the large number of reserve officers needed and the experience had in the World War in developing officer material, it is essential, in building up and maintaining the necessary number, that cognizance be taken of the widely different qualifications required for filling various offices. Good combat officers are difficult to obtain and should not be used for noncombatant duty if it can be avoided. Conversely, the required technical experts and specialists should be provided and utilized in their proper spheres. With this in mind reserve officers are divided into two general classes.

14. The two general classes of reserve officers are the following:

(a) *Officers for Service with Troops*.—This class includes all officers

¹Reprinted from *U. S. Army Recruiting News* of August 15, 1921.

directly concerned with the tactical handling of troops. As there is no vocation in civil life that fully fits any individual for the tactical handling of troops, officers appointed for this class of service must be qualified by military training and experience. They must also be prepared, after appointment, to devote a reasonable amount of time to military instruction and preparation for combat duty. All officers of infantry, cavalry, field artillery and coast artillery are in this class. Officers of other branches of the service are in this class only in case of appointment for duty directly concerned with the tactical handling of troops.

(b) *Officers for Special Service.*—This class includes officers not concerned with the tactical handling of troops and, in general, includes those officers whose duties in the army are along the lines of a profession or occupation in civil life. As their work in civil life, to a great extent, fits such officers for their contemplated service in the Army, they may be appointed largely on their professional or occupational standing and experience. After appointment they should be prepared, in general, to devote such time to military instruction as will enable them to know how their special qualifications fit into and can be best utilized in the military service.

17. In making appointments, the class of duty for which appointment is desired will be given due consideration. Applicants, in submitting applications, and examining boards, in conducting examinations, will be guided by the general principles stated herein.

18. There are three general methods of determining the qualifications of an applicant for appointment:

- (a) Examination of his record.
- (b) Attendance at a course of instruction.
- (c) Personal examination.

The first method applies primarily to persons who have served as officers during the World War and from whose records qualifications for appointment may be determined. The second method applies to persons qualifying at training camps, to R. O. T. C. students, flying cadets, etc. The third method applies to all persons not covered by the first and second methods.

19. The law confers certain eligibility for appointment on persons who served as officers during the World War. Such appointments can generally be made from an examination of records, but as time elapses records of World War service become less reliable and valuable as evidence of fitness for appointment. Individuals change, as do also the requirements of the military service. Some instruction and training are necessary to keep persons who have served in the Army qualified

for service in a future emergency. World War records cannot be accepted for an indefinite time as evidence of qualifications for appointment. Furthermore, after the Officers' Reserve Corps has reached its required strength, vacancies in grades above the lowest should be filled by promotion, rather than by making new appointments. Prompt mobilization in an emergency requires that officers be already enrolled, and does not permit of the delay incident to reviewing past records and ascertaining the physical and other fitness of applicants for appointment. World War veterans are needed, and their services are urgently desired without delay to assist in the organization and development of the Army of the United States, under the provisions of the amended National Defense Act. From a consideration of all factors it has been deemed expedient to place a time limit, until November 11, 1923, (five years after the termination of hostilities), upon the appointment of former officers by an examination of their records alone. After that date World War service will receive due consideration, but will not, of itself, be accepted as evidence of qualification for appointment, and additional demonstration of the qualification by examination will be required. The time limit placed is reasonable and allows ample time for former officers, who so desire, to become members of the Officers' Reserve Corps.

21. One means by which warrant officers and enlisted men of the Regular Army and National Guard may secure appointment in the Officers' Reserve Corps is by qualification at training camps. Many will not have an opportunity to attend these camps, as the funds available and the facilities of the camps will be needed primarily for the development of officers from civilian candidates. Consequently, an opportunity is provided for warrant officers and enlisted men, while serving with their organizations, to be given courses of instruction and training that will fit them for reserve commissions, such courses terminating in an examination for appointment.

22. In appointment, as in other matters pertaining to reserve officers, a policy of decentralization is observed, only sufficient centralized control being retained as is essential to the maintenance of a reasonable degree of uniformity throughout the entire Officers' Reserve Corps. In all cases in which appointment may be made based upon examination of records only, examinations are conducted in Washington, where the records are filed. In all cases requiring a personal examination, the conducting of such examination is delegated to corps area and department commanders. To provide uniform standards throughout the service, the general scope of examinations is prescribed by the War Department. To accommodate to varying conditions, examining boards are authorized

to grant such exemptions as in their judgment may be desirable, to determine details of examination, and to make additional investigations, if necessary. With this authority of the boards is coupled a responsibility that they recommend for appointment only those persons who may be reasonably expected to make efficient officers in an emergency. Failure to maintain a proper standard will give rise to a just cause of complaint from reserve officers who expect and who are entitled to the preservation of such a standard, and will indicate a failure to appreciate the outstanding lessons of the World War as to the demand for competent officers and the undesirability of elimination during an emergency.

23. Reserve officers are needed primarily, but not exclusively, for units of the Organized Reserves. They should be assigned, so far as practicable, to units near their places of residence. The location and development of units of the Organized Reserves is delegated to department and corps area commanders. Available reserve officers are also allotted to them for assignment. As the organization of units progresses, and it is found that additional officers are needed it is contemplated that suitable and available officer material will be located and obtained by the department or corps area commanders under some of the means provided for appointment. The procurement of reserve officers for the Organized Reserves is thus largely in the hands of the department or corps area commanders. As soon as practicable a full quota of officers for the Organized Reserves should be procured and maintained, as well as the officers that will be required in an emergency for the other components of the Army of the United States.

PROMOTION

25. All steps taken in time of peace in the development of the Officers Reserve Corps, including promotions therein, must be with a view to readiness for the prompt mobilization of an efficient army in time of war. In time of war, after the components of the army have been called to active service, all officers will be equally eligible for promotion, regardless of whether they have served in time of peace, in the Regular Army, the National Guard, or the Organized Reserves. Promotion in time of war must in general be based upon the method of selection, with due consideration of the needs of the military service and the relative qualifications of persons available for promotion. The promotion system embodied in these regulations is applicable in time of peace only. The system is formulated with a view to giving such promotion as appears reasonable and proper, in time of peace, with the understanding that, in time of war, conditions will afford exceptional officers an opportunity, which is lacking in time of peace, to demonstrate clearly their military capacity and fitness for advancement.

26. It is impossible to determine in time of peace the full extent of the qualifications of reserve officers for duty in time of war. Their promotion, in time of peace, must be based upon considerations of their general and professional qualifications, the interest manifested by them, their length of service, and age, with a view to providing reasonable advancement to the grades for which it is believed they will be fitted in time of war and from which they will have a fair and equal opportunity for further advancement under conditions of active service.

27. With a view to developing the interest, ability and qualities of military leadership of the citizen soldier, the system of promotion is designed to afford any competent reserve officer an opportunity to rise by successive steps to any office in the army which is to be filled, and for which he has the ability to qualify. With this object in view, no fixed numbers are prescribed for the various grades and branches of the Officers' Reserve Corps. So far as numbers in each grade are concerned, the only restrictions placed upon promotions is that there must be a suitable office and duty to which the promoted officer can be assigned.

28. In addition to theoretical training and instruction, an officer, to be qualified for promotion, must have the knowledge and judgment that develop with age and experience. A minimum length of service in a grade is, therefore, required as a condition of eligibility for advancement to the next higher grade. The minimum of one year required by law being of limited application, a minimum of three years' service in a grade is required by these regulations. Of the three years, one must be in the Officers' Reserve Corps as required by law, liberal credit being given toward the other two years for service rendered as an officer during or since the World War. This minimum period and the service credited thereto allow an opportunity for promotion commensurate with the time available, interest and inclination of the officer to apply himself to the acquirement of knowledge of his profession, and also takes cognizance of experience gained in active service during the World War. It is not expected that all reserve officers will be able to qualify for promotion at the expiration of such period. Length of service is but one factor in determining qualification for advancement. The actual period of service in any grade prior to promotion will depend upon the capacity and industry of each individual officer as affected by the time that he can spare for military study.

Minimum Time to be Served in Each Grade.—To be eligible for promotion to any grade an officer must be credited with three years' service in the next lower grade, one year of which must in every case have been in the Officers' Reserve Corps since November 11, 1918. In computing the required three years' service in any grade there will be credited

service in the grade in the Officers' Reserve Corps since November 11, 1918, active service in the same or higher grade in any component of the United States Army between April 6, 1917, and December 31, 1920; double credit being given for such of the above service as was rendered during the period of hostilities, i. e., between April 6, 1917, and November 11, 1918. Except for the one year which must have been in the Officers' Reserve Corps, there will also be credited service as a federally recognized officer of the National Guard since November 11, 1918. No service of any kind prior to April 6, 1917, is to be credited nor is any but active service between April 6, 1917, and November 11, 1918, to be credited.

29. An officer eligible for promotion is not considered therefor until he signifies his readiness to undergo the examination prescribed. An officer cannot be considered qualified to fill an office in the next higher grade until, by a suitable test, he can demonstrate his professional fitness therefor. These officers who are eligible for promotion are urged to signify their readiness for examination when, but not before, they feel themselves reasonably qualified. Requests or recommendations to be examined for promotion must pass through military channels and will be approved, unless the recommendations made thereon indicate that the officer is not deemed sufficiently qualified to justify examination, or that there is no suitable assignment. In submitting requests or recommendations, it is to the interest of all concerned to avoid the examination of officers who are not reasonably prepared and qualified for examination. As examining boards are required in case any officer examined is found not qualified for promotion, to inquire into and report upon his qualifications to continue in his grade, it is to the interest of each reserve officer to refrain from signifying his readiness for examination until he feels himself reasonably qualified therefor.

30. Briefly, the conditions for promotion are:

(a) A minimum of three years' actual or constructive service in the grade from which promoted.

(b) A suitable assignment for the officer if promoted.

(c) A demonstration of qualifications by examination.

ASSIGNMENT

31. So far as is practicable, it is contemplated that a mobilization of the army be one of organizations rather than of individuals. To accomplish this and to have all reserve officers understand and be prepared for their specific duties in time of war, all reserve officers will, so far as practicable, be given specific assignments in time of peace. All reserve officers are, in time of peace, under the administrative control

of the commander of the corps area or department in which their permanent residences are located. With the exception of a limited number of reserve officers withheld by the War Department, or branches thereof, for special assignment to duties not pertaining to the organization of a corps area or department, all reserve officers are under the jurisdiction of a corps area or department commander for the purpose of assignment.

32. As a basis upon which to make suitable assignments the War Department records for each reserve officer are carefully examined by the chief of the branch in which the officer is appointed. The data having a bearing upon the qualifications, suitability, and preference for assignment is placed upon a form suitable for ready use. Except for the few officers retained for assignment by the War Department or branches thereof, the form bearing the assignment data is sent to the corps area or department commander by whom the officer is to be assigned. After the initial classification, the forms containing data bearing upon the officers' qualifications will be kept up to date by appropriate entries thereon by the assigning authority. The latter will afford officers a full opportunity for modifying their preferences and will take the necessary steps to make as complete and accurate as possible the data bearing upon the qualifications of each officer.

33. The specific assignment of each reserve officer is to be determined by the authority authorized to assign him as soon as practicable after receipt of the initial data covering his qualifications for assignment. Reserve officers may be assigned or attached to all components of the Army of the United States. Assignments to the Regular Army will be made only as specifically directed by the War Department from time to time. All reserve officers who are also officers, warrant officers or enlisted men of the National Guard will be considered as on duty with that component of the army, and will be given no other assignment as reserve officers. The assignment of other reserve officers to the National Guard will be made only when authorized by the War Department.

34. In making assignments, due consideration will be given to general and special qualifications, limitations as to the kind of duty for which appointed or suited, place of residence and local affiliations, and the preferences of the officers. So far as practicable, all reserve officers are to be assigned to units in the vicinity of their places of residence. However, World War veterans who so desire may be assigned to their reconstituted former war organizations in the discretion of corps area and department commanders. Upon a permanent change of residence a new assignment will be made if necessary, but officers will be retained in their original units or in higher organizations of which such units form parts if consistent with the general principles stated above.

35. In making assignments, the normal legal obligation of reserve officers will be kept in mind, that is, the obligation to serve only in a national emergency expressly declared by Congress. In general, therefore, reserve officers will be assigned to units of the Organized Reserves. Assignments involving an obligation to serve in lesser emergencies with other components of the Army of the United States can be made only with the consent of the officers concerned.

TRAINING

39. In order that reserve officers fulfill the purpose for which appointed, it is essential that they receive sufficient training and instruction in time of peace to qualify them for the performance of their duties in an emergency. The amount of training and instruction necessary varies with the experience, rank and qualifications of individuals, and with the nature of the duties which they will be called upon to perform in an emergency.

41. In time of peace the maximum obligation for active duty for reserve officers is fifteen days in any calendar year. However, reserve officers can be ordered to active duty only within the limits of funds appropriated by Congress for this specific purpose. The training projects of the War Department must necessarily be prepared and announced from time to time as appropriations are made. Having in view the limited funds available and the desirability of giving all reserve officers approximately equal facilities for training, the granting of individual requests for training at a particular time cannot in general, be approved unless they accord with approved training schemes.

Should any officer be called for the fifteen-day training period, he may be exempted from such training, if the special circumstances warrant.

42. Within the limits of funds and accommodations available, reserve officers will be authorized to attend the various service schools. The attendance at such schools is to be regulated so as to cause a uniform distribution throughout the Organized Reserves of officers who have attended such schools.

44. In general some training and instruction while on an inactive status will be necessary to replace, or to supplement training received while on active duty. This will, in general, take the form of instruction by Regular Army officers detailed for duty with units of the Organized Reserves of correspondence courses, or of study engaged in by the officer himself. Organization commanders, corps area and department commanders, and chiefs of branches have a mutual responsibility in accomplishing the training and instruction of reserve officers, and will,

from time to time, afford these officers such facilities for training and instruction when on an inactive status as circumstances permit. Within the limits of funds that may be utilized for this purpose, the War Department will make available for the use of reserve officers such official publications as are necessary or desirable for their instruction.

ACTIVE DUTY

45. Active duty for reserve officers is of two general classes: First, active duty in a national emergency expressly declared by Congress, and second, active duty in time of peace for training or instruction, or for some duty of a temporary nature.

47. The maximum obligation for active duty in time of peace is fifteen days in a calendar year. It will, in general, be impracticable to require this maximum. When officers are to be called for a fifteen-day training period, they will be given as much advance notice as practicable, and any officer upon whom such a call to duty would work a hardship may be excused from attendance for that call. Specially selected officers will be called to active duty from time to time for the following temporary duties:

- (a) As additional members of the War Department General Staff.
- (b) To attend the various service schools.
- (c) For duty with organizations of the Regular Army or Organized Reserves.
- (d) As instructors at training camps or schools.
- (e) For consultation, duty on courts-martial or boards, or other duties for which specially qualified.

50. When on active duty reserve officers are subject to the Articles of War and to assignment to any duty, and receive the pay and allowances provided by law for officers of like grade of the Regular Army. Reserve officers are not entitled to retirement or retired pay, their compensation in the event of disability being provided for by law.

HEALTH FORTNIGHT TO MARK SEMICENTENNIAL OF AMERICAN PUBLIC HEALTH ASSOCIATION

The fiftieth annual meeting of the American Public Health Association will be the occasion of a Health Fortnight. From November 8 to 19, New York City will be the scene of activities connected with this event, and the publicity, with its slogan "Health First," will stimulate interest throughout the country.

Health Fortnight will include three major divisions—a Health Institute from November 8 to 11; a Health Exposition, November 14 to 19; the Fiftieth Annual Meeting of the American Public Health Association, November 14 to 19. Representatives from virtually

every state in the Union and from many foreign countries will participate in the extensive program.

To focus the attention of the general public upon this celebration, November 13 will be observed as Health Sunday in many churches. Health Day will also be observed in the synagogues and in numerous business and social organizations. Speakers prepared to talk authoritatively on health topics will be furnished on request to any of these organizations. The New York County Chapter of the American Red Cross is cooperating with the general committee in the arrangement for this service.

The Public Health Exposition will undoubtedly make the widest appeal to the lay public. It will be the largest affair of its kind ever held in New York City. It will be conducted under the joint auspices of the Department of Health of the City of New York and the American Public Health Association. Already allotments of space indicate that at least two entire floors of the Grand Central Palace will be occupied by exhibitors. The exhibits will include those of educational and philanthropic organizations and those of commercial houses producing approved articles of health value.

Every legitimate means will be utilized to promote attendance at the exposition, for this will be the most effective way in which the message of Health Fortnight may be brought to the public. The fact that a similar health exposition held in Chicago a year ago drew an attendance of over one hundred thousand indicates the extent to which this form of popular education may be carried. Naturally, in New York with its larger population, a proportionately greater attendance is expected at the exposition. The profits from the sale of tickets, after the costs of the exposition and the convention are defrayed, will be devoted to establishing nutritional clinics for the benefit of undernourished children. In this connection, Dr. Royal S. Copeland, Health Commissioner of the City of New York, will present a series of educational exhibits in which instruction in the feeding of children will be featured. Dr. Copeland is chairman of the exposition; A. W. Hedrich, of the American Public Health Association, is secretary, and Dr. C. E. North, treasurer and general manager.

The Health Institute, from November 8 to 11, will present to visitors to the convention an unusual opportunity to see the operations of established methods applied to various phases of public health work. About forty demonstrations have been planned. The thoroughness of the program may be gathered from the fact that the institute is sponsored by the American Public Health Association, the Health Department of the City of New York, the New York State Depart-

ment of Health, the U. S. Public Health Service, the National Health Council, and the Committee on Public Health of the New York Academy of Medicine, with the cooperation of approximately one hundred other organizations. The chairman of the committee in charge is Dr. W. A. Evans. The director of the institute is Dr. D. B. Armstrong, of the National Health Council.

Following the week of the institute and the observance of Health Sunday will come the opening of the scientific sessions, the meetings of the American Public Health Association in celebration of its semicentennial. The sessions will begin on November 14, and the headquarters will be at the Hotel Astor, Broadway and 44th Street.

The scope of the meetings is indicated by their division into the following: General Sessions, Public Health Administration, Child Hygiene, Public Health Publicity and Education, Laboratory Section, Vital Statistics Section, Industrial Hygiene Section, and Food and Drug Section. Speakers before these sections will include health workers of world-wide repute.

It is almost unprecedented to find an organization celebrating its semicentennial while its founder is on the verge of marking his own centennial. This is the case, however, with the American Public Health Association, for its founder, Dr. Stephen Smith, although in his ninety-ninth year, is still active and will participate in the meeting. A banquet will be held in Dr. Smith's honor as a part of the semicentennial celebration.

As a permanent souvenir of the semicentennial and as a record of the work accomplished, a jubilee historical volume entitled, "Fifty Years of Public Health," will be ready for distribution during Health Fortnight. Although, as the title indicates, the book concentrates on progress made in the last half-century, it also traces the public health movement from its early beginning. Further information regarding the semicentennial may be obtained from the American Public Health Association, 370 Seventh Avenue, New York City.

DO YOUR SHARE

During the war the American Red Cross had 22,000,000 members. Today it has only 6,000,000. Yet the calls for its help are more varied and insistent than ever before. Not only is it still engaged in fulfilling obligations incurred during the war, but it has launched a nation-wide public health program in this country by means of health centers, public health nursing, instruction in first aid, food selection, home hygiene, care of the sick, and disaster relief preparedness. This work is all carried on largely with the funds received from the dollar member-

ship dues. If you are a member, pay a dollar and renew your membership during the Roll Call, November 11 to 24. If you are not a member, join this year and have your share in this work.

MEETING OF THE SOUTHERN MEDICAL ASSOCIATION

The fifteenth annual meeting of the Southern Medical Association will take place at Hot Springs, Arkansas (Hot Springs National Park) Monday, Tuesday, Wednesday, and Thursday, November 14 to 17, 1921.

A varied professional program is offered, as well as other features of recreation and interest both for the medical men attending and the ladies of their families.

Any further information in regard to this meeting may be obtained by writing to C. P. Loran, business manager, Birmingham, Alabama.

WHAT THE U. S. PUBLIC HEALTH SERVICE HAS DONE FOR THE SOLDIER

"Before considering what the Public Health Service has done for the soldiers," says Surgeon General H. C. Cumming, of the U. S. Public Health Service, "it seems best to outline what it has been authorized to do in the past and is now authorized to do under existing legislation.

"Contrary to popular belief, the hospitalization and care of disabled soldiers is not one of the ordinary duties of the service. Two and a half years ago the service had only about 20 'Marine' hospitals, all of them small, in which it was caring for about 1,500 patients, more than 1,200 of whom were sailors of the merchant marine, lighthouse keepers, members of the revenue cutter and coastguard services, and so on, and only 300 were ex-soldiers, for which it was caring by direction of the Secretary of the Treasury at the request of the Director of the War Risk Bureau.

"The wounded, however, were beginning to come back home in increasing numbers, and it appeared that few hospitals, other than those of the service, were available as shelters for them. Under these circumstances Congress directed (March 3, 1919) the Public Health Service to 'provide immediate additional hospital and sanatorium facilities for the care and treatment of sick and disabled soldiers, sailors, and marines, army and navy nurses (male and female), patients of the War Risk Insurance Bureau.'

This "providing" was and has remained the primary duty of the Public Health Service to soldier patients, but to it have been added sundry sorts of work that seemed necessary to its full discharge. For instance, the service established, in all parts of the country, supervisors whose chief duties were to search out suffering and disabled ex-soldiers who were unaware of their rights under the laws, to guide them (and

all others who desired) in making application for such care as they needed, and to see that all who needed hospital and medical care and who could establish an apparent right to it should get it at once without waiting for individual authority from Washington.

"Providing," however, was the real duty of the service; and, broadly, that duty has always been thoroughly discharged. No ex-soldier who could produce any reasonable evidence of his right to hospital care has ever been denied it by the service. The insistence on at least primary proof has proved to be essential; cast-off uniforms are cheap and masqueraders in them are not lacking; and if every one who applied for hospitalization were admitted without at least some investigation no room would be left for rightful applicants.

That the hospital service provided has not always been what it should have been is not denied. Defects have occurred—defects which probably troubled the service more than they troubled the vast majority of the patients—but they were due to the immensity of the problem and the swiftness with which it came upon the country.

Not that the Public Health Service failed to foresee what was coming. It did foresee it! As a result, on December 15, 1919, the Secretary of the Treasury reported to Congress (Public Document 481, 66th Congress) that within two years hospital facilities would be required for 30,660 patients and that \$85,000,000 in installments would be needed to provide this. That the report was justified appears from the fact that little more than a year and a half later (on July 31, 1920) 27,000 patients were being cared for by the service, about 10,000 of them in private hospitals under contract.

Nevertheless, when that request was made the service was subjected to a great deal of criticism for asking for so great a sum. It was also urged that the facilities for the care of disabled soldiers that had sufficed during the war (for example, the hospitals at the army camps) would serve very well for them when the war was over. These councils prevailed, and no money for construction was appropriated.

Certain limited funds that had been provided by the act of March 3, 1919, were, however, available for construction, purchase, and for leasing. With these, so far as they went, existing facilities were expanded, others were leased or bought, and certain base hospitals taken over from the Army and from the Navy were improved. In addition, the use of certain limited facilities in National Soldier Homes were made available.

By such methods and by the liberal use of contract hospitals the Public Health Service has been able to get along, though naturally it has been subjected to more or less undeserved criticism, largely directed against the accommodations supplied in some of the service hospitals

and in many contract hospitals. Many of these complaints were unreasonable, but some of them were justified or at least well founded.

In consequence a few government hospitals have been closed, and a great many contract hospitals have been stricken from the lists. Many others would have been closed or stricken off but for the fact that it would have been necessary to take on in their place others that would probably prove even less satisfactory. Those who have criticised the facilities offered in the hospitals should realize that they were the best that the service could at the moment obtain. With a certain percentage of the available accommodations it has always been largely a choice of evils, and the service has taken the best it could get, not because they were satisfactory but because it had to take something.

The selection and control of the contract hospitals have now been turned back to the War Risk Bureau, where it has always properly belonged. There has never been any particular reason other than administrative why the Public Health Service should make these contracts instead of their being made by the War Risk Bureau direct.

On March 4, 1921, however, Congress appropriated \$18,600,000 for new construction and for extensions, thus entering on a new program, which will probably ultimately furnish government patients with suitable institutions suitably located. The eighteen millions appropriated, however, are of course inadequate for the work and must be largely supplemented.

Under the terms of the Sweet Bill, just enacted, the legal duties of the service to the soldiers are practically unchanged. It will continue to act, as it always has acted, as an agency for hospitalization, the only difference being that it now acts for the Veterans' Bureau instead of the War Risk Bureau.

This condition, however, may not endure. The Sweet Bill gives the President authority, in his discretion, to transfer bodily to the control of the Veterans' Bureau any hospitals now controlled by the service. He has not yet transferred any, but he may do so tomorrow or he may never do so. If he does transfer them, the Public Health's connection with the soldiers will presumably end, and it will be left to carry on its before-the-war duties, evolved during a century and a quarter, of protecting the general public health of the United States.



BOOK REVIEWS

ANXIETY HYSTERIA. *Modern Views on some Neuroses*, by C. H. L. Hixon, M. D., M. R. C. S.; Senior Neurologist, Ministry of Pensions' Neurological Hospital, Exeter; Late House Physician, Casualty Officer, and Resident Anesthetist, St. Thomas' Hospital; Captain, R. A. M. C.; Officer-in-Charge, Neurological Section, Reading War Hospital; and D. Matthew, M. A., M. B., Ch. B., Neurologist, Ministry of Pensions' Neurological Hospital, Exeter; Late House Physician and House Surgeon, Dundee Royal Infirmary; Captain, R. A. M. C.; Neurologist, Craiglockhart War Hospital for Officers, Edinburgh; with a foreword by Col. Sir A. Lile Webb, K. B. E., C. B., Ch. G., etc., Director General of Medical Services, Ministry of Pensions. Pp. 124. New York City: Paul B. Hoeber, 1921. Price, \$1.50.

The aftermath of the World War brought in its wake a large group of patients who suffered from a functional breakdown of the nervous system. The collapse of the mind of soldiers undergoing severe mental and emotional stress and strain was not confined to the army of any one nation, but was widespread among all the nations. The problem of correctly interpreting these functional nervous disorders, in order to rationalize treatment and to restore these men with shattered minds to a useful place in the community, was one of the brilliant achievements of the war. In this brochure the authors draw upon their war experience, gained in front-line trenches and in hospitals especially devoted to the neurological cases. The predominating type of disorder was found to be an "Anxiety Hysteria." Of this a concise account is given in brief and straightforward manner, illustrating the particular phases of the subject, with case histories of actual cases. Chapters are devoted to psychological and analytical methods used in diagnosis, to interpretation of symptoms, and to treatment.

The book is meant for the physician who has not specialized in neurology and psychiatry, and will be found valuable to a clear understanding of the subject of functional nervous disorders.

L. A. NEWFIELD, M. D.

THE TREATMENT OF ACUTE INFECTIOUS DISEASES, by Frank Sherman Meara, M.D., Ph.D., Professor of Clinical Medicine and formerly Professor of Therapeutics in the Cornell University Medical College in New York City, etc. Second Edition, Revised. Pp. 806. Cloth, Price \$7. New York: The Macmillan Company, 1921.

The second edition of this book has been enlarged by the addition of new chapters on acute rhinitis, tonsillitis and Vincent's angina, acute laryngitis, acute bronchitis and tracheitis, streptococcus pneumonia, grip or sporadic influenza, encephalitis lethargica, rat-bite fever, and trench fever.

The plan followed consists in giving the essential features of the etiology, pathology and symptomatology of the infectious diseases. The description is clear, and not only embraces the experience gained first hand by the author in his years of practice, but also gives due value to the recent advances in all fields of medicine. There follows, at greater length, the detailed methods of treatment. A fault in many books on treatment consists in generalization and in assuming that the reader is familiar with what the author has in mind. This book is remarkably free from any such fault. Methods are described with full details concerning the therapeutic

procedure the physician may be called upon to impart to others or to perform himself.

A valuable innovation is a summary at the end of each chapter, in outline form, so written that the essentials can be grasped by the busy practitioner or by the student in review. Chapters that will be found of great value, especially, are chapters on pneumonia, epidemic influenza, and streptococcus pneumonia. But it is difficult to single out parts of a book that is so uniformly of value. The chapters on typhoid and paratyphoid fevers have been entirely rewritten.

This book easily ranks as one of the best books written on the subject of therapeutics of infectious diseases. It is invaluable for the practicing physician and should be in the hands of every student of medicine.

L. A. NEWFIELD, M.D.

BOOKS RECEIVED

Books received are acknowledged in this department and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interest of our readers as space permits.

THE SURGICAL CLINICS OF NORTH AMERICA (Boston Number, June, 1921) vol. 1, No. 3. By Boston Surgeons. 345 pages, with 159 illustrations. Per clinic year, paper, \$12.00 net; cloth, \$16.00 net. Philadelphia and London: W. B. Saunders Company.

ESSAYS ON SURGICAL SUBJECTS, by Sir Berkeley Moynihan, K.C.M.G., C.B., Leeds, England. Octavo of 253 pages, illustrated. Philadelphia and London: W. B. Saunders Company, 1921. Cloth, \$5.00 net.

THERAPEUTICS, MATERIA MEDICA AND PHARMACY, by Samuel O. O. Potter, A.M., M.D., M.R.C.P. Lond. Thirteenth edition revised and enlarged. Philadelphia: P. Blakiston's Son & Company, 1921. Price, \$8.50.

THE MICROTOMIST'S VADE-MECUM.—A Handbook of the Methods of Microscopic Anatomy, by Arthur Bolles Lee, Hon. F.R.M.S. Eighth edition. Philadelphia: P. Blakiston's Son & Company, 1921. Price, \$6.50 net.

THE SURGICAL CLINICS OF NORTH AMERICA (Chicago Number) vol. 1, No. 4. Philadelphia and London: W. B. Saunders Company.

DISEASES OF THE DIGESTIVE ORGANS, by Charles D. Aaron, Sc.D., M.D., F.A.C.P. Third edition, thoroughly revised with 164 engravings, 48 roentgenograms and 13 colored plates. Philadelphia and New York: Lea & Febiger, 1921. Price, \$10.00 net.

URINARY ANALYSIS AND DIAGNOSIS BY MICROSCOPICAL AND CHEMICAL EXAMINATION, by Louis Heitzmann, M.D. Fourth edition, revised and enlarged, with 131 illustrations. New York: William Wood & Company, 1921.

MODERN ITALIAN SURGERY AND OLD UNIVERSITIES OF ITALY, by Paolo de Vecchi, M.D. With 15 full-page illustrations. New York: Paul B. Hoeber, 1921. Price, \$5.00 net.

Obituary

Those of our membership whose deaths have been noted since our last report are as follows:

Surgeon William H. Baldwin, U. S. P. H. S.

1st Lieut. F. J. Hirst, M. R. C., U. S. Army.

Capt. George A. Lung, M. C., U. S. Navy.

1st Lieut. Carl Wagner, M. R. C., U. S. Army.

Capt. A. R. Wentworth, M. C., U. S. Navy.

Brig. General Alfred A. Woodhull, U. S. Army.

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NOTES ON THE HISTORY OF MILITARY MEDICINE

(Continued from November, 1921)

BY LIEUT. COLONEL FIELDING H. GARRISON

Medical Corps, United States Army

III. MILITARY MEDICINE IN ANTIQUITY

Prehistoric

IN PREHISTORIC time we do not find, do not expect to find, organized armies. Cave man was occupied with hunting, fishing, herding, and such warfare as he made with stocks and stones, flint arrows, spears and axes, was in the nature of hand-to-hand combats with his own kind, or with gigantic animals. In these conflicts, one principle was forced upon his attention; he won out as much by his wits as by native strength; the best brains were the winning brains. Three great English physiologists have, in fact, devoted their lives to a proof of the proposition that the coordination and integration of the nervous and chemical mechanisms regulating the animal or human organism are the principal factors in its evolution and development. As Gaskell puts it: "It is not size, it is not strength, that has conferred the great advantage in the struggle, but acuteness."

Four paintings exhibited by Paul Jamin in the Parisian Salons of 1885-1903¹ illustrate some of these phases in prehistoric human existence. One represents a number of cave men fighting over a woman; another a group of men fleeing in the snow before an advancing mammoth; a third a group of women and children looking on while a primitive artist executes one of the gigantic mural paintings in a prehistoric cave; a fourth, a savage chieftain, clad in skins, with casque and spear, appalled at the discovery of his wife in the clutches of a lion at the mouth of a cave. All that we know of early man's life is here: his realization of the need of organizing means of defense for himself, his family and his fellows against inevitable catastrophes; lust of power and possession as the cause of war; the evolution of union and cooperation in the defense of a social group against formidable enemies of gigantic size; and the development of the arts by peace. In the face of primitive social forces

¹ Rev. de l'École d'anthrop. de Paris, 1903, xiii, pl. ii, v.

like these, such motives as the *cherchez la femme* in the Trojan and other wars (indicated with frank indecency in the third satire of Horace) dwindle into relative insignificance. Visualize prehistoric man as hunting, first singly, an Ishmaelite with his hands against all his fellows, then in couples, then in packs; assume a dispute over spoils of the chase or strayed animals from the herd between two men of different gangs; then an encounter, with eventual participation of all the gangsters. We have at once a primitive instance of Pirogoff's theory of war as a communicable disease, a "traumatic epidemic," not different from what was to happen hundreds of times later everywhere, "from China to Peru," in Scotland or Corsica, or among early settlers and mountaineers in our own country. A sense of the value of organization, discipline and leadership probably arose when the sessile people who cultivated wild wheat on the fertile plains became domesticated and were assailed by the hardy nomadic hunters and herdsman, whose commissariat of milk and milk products travelled with them. Without organized military forces, the tamed went down before the untamed; *homo domesticus* was overcome by *homo ferus*, with the amusing sequel that wherever a conquering race settled down on conquered territory, they became assimilated to the civilization of the conquered people through intermarriage with their women. But that even barbaric communities could maintain peace with honor, maintaining their individuality on the Scotch principle,

"Here

Ye maunna think to domineer,"

is evident from the memorable passage in Tacitus about the Chauci, which the great historian intended as an ironical rebuke to the aggressions of imperial Rome:

They are the noblest of the German tribes, and so constituted as to prefer to protect their vast domain by justice alone; they are neither grasping nor lawless; preferring quietude and seclusion, they provoke no wars and dispatch no raiders on marauding forays; the special proof of their sterling strength is, indeed, just this: that they do not depend for their superior position upon injustice; yet they are ever ready with arms, and, if circumstances require, with armies, with men and horsemen in abundance; so, while they uphold peace, their military reputation does not suffer (Germania, 35).

In encounters between West-European barbarians in the historic period, it was usually the custom to drag the wounded into safety and shelter, where possible (Tacitus).² But, as we shall see, definite organization for the rescue and care of the wounded has seldom been fostered

²Of the Germanic tribes, Tacitus says "they carry off their dead and wounded even in drawn battles (*corpora suorum etiam in dubiis proeliis referunt*.—Germania, 6). In the encounter between the Caledonians and Romans, in the Agricola, he tells how the scattered Britons, amid the tribal wailing, began to drag off their wounded and to check up on those unhurt (*Britanni palantes mixtoque virorum mulierumque ploratu trahere vulneratos, vocare integros*.—Agricola, 38).

except by experienced commanders of unique military genius. The great Mongol raids of the Middle Ages, the most devastating on record, sweeping all Asia and half of Europe, were characterized by massacre of the enemy's wounded and fatalistic Oriental indifference to their own. These are facts in anthropology.

The evolution of the art of medicine in primitive society is beautifully indicated in the ancient treatise of Celsus as follows:

Some of the sick, on account of their eagerness, took food on the first day; some, on account of loathing, abstained; and the disease, in those who refrained, was more relieved. Some ate during a fever, some a little before it; others after it had subsided, and those who had waited to the end did best. For the same reason, some at the beginning of an illness used a full diet, others a spare, and the former were made worse. Occurring daily, such things impressed careful men, who noted what had best helped the sick, and began to prescribe them. In this way, medicine had its rise from the experience of the recovery of some, of the death of others, distinguishing the hurtful from the salutary things.³

The disease to which prehistoric man was most exposed was arthritis deformans, the "cave gont" of Virchow, which, to an appalling degree, affected alike the primitive inhabitants of Europe and the Egyptians on the banks of the Nile, as evidenced in innumerable prehistoric skeletons and mummies. The Lake Dwellings represent, in some measure, the efforts of the cave men to get above and away from the evil effects of sleeping on the damp ground.⁴

Egypt

In Egypt, the mother of civilization, we find warfare by means of organized armies already a going concern. How recent the "antiquity" of Egypt we may judge by the dictum that if man's existence in space and time be represented by the circuit of a clock from XII to XII, then paleolithic man occupied the complete circuit in time up to XI, neolithic man all that remains up to the last half minute, which small interval represents the 8,000 years in the subhuman existence of historic or "civilized" man and his forbears.⁵ How highly specialized the Egyptian civilization, how much like our own in many curious respects, may be gathered from a glance at some of the exhibits listed in Sudhoff's Dresden Catalogue:

³ Celsus: *De re medica*. Proemium. Cited by Sir William Osler in his Silliman Lectures (Yale Press, 1921).

⁴ Sudhoff: *Ann. Med. History*, N. Y., 1917-18, I, 111-112. Tacitus (*Germania*, 46) describes the Fenni, a Slavic or gypsy tribe, as sleeping on the damp ground (*cubili humus*). In travelling through lower Hungary in 1814, Dr. Richard Bright (of Bright's disease) found the same people living in dugouts:

"Now I believe the Troglodytes of old,
Whereof Herodotus and Strabo told,
Since everywhere, about these parts in holes,
Cunicular men I find and human moles."

Bright: *Travels from Vienna through Lower Hungary*. London, 1818, 615.

⁵ B. Holmes and P. G. Kitterman: *Medicine in Ancient Egypt*, Cincinnati, 1911, 7.

e. g., baking bread; a market, with separate stands for fish, vegetables, etc.; brewing beer; making a fire with bellows; people in bed; cosmetics, toilet articles and vanity sets; a barber clipping hair; razors; a bath-room; accouchement of queen by four midwives; clitoridectomy; wrestling matches; secretaries taking dictation; ship-building; a transport barge or lighter; four statues of physicians; and (220 B. C.) complaint of a Greek lady to Ptolemy on being parboiled in a public steam bath.⁶ A box of Egyptian toys, recently excavated from a tomb by the Metropolitan Museum of Art, contains a model bakery, stable, carpenter's shop, slaughter-house, etc.⁷

Life in this antique world was organized about as follows: At the top were the learned class, with the temple as the repository of records and center of knowledge. Lower down were the farmers, herdsmen, merchants and artisans, with a great mixed substratum of servants, slaves, gang-laborers, mercenary soldiers and sailors. From the primitive concept of chief priest as tribal leader and medicine-man was presently evolved, through division of labor, a military leader or king, with subaltern commanders and warriors, as the defensive arm;⁸ and later another class, the physicians who were already specialists, in that each applied himself to diseases of one part of the body only. The military monarch was eventually erected to godhead and was often at odds with the priests in consequence. Egypt was essentially a matriarchal civilization, paying great regard to maternity insurance and child welfare. Each district of the country had a military guard of its own, with arsenals or barracks, and these guards were, in time of war, consolidated into an army, strengthened by mercenary negro troops from the south. Of their medical service in campaign, Diodorus Siculus relates (i, 82):

On campaigns or other expeditions out of the country, the sick are treated without cost to themselves; for the physicians receive compensation from the state and practice medicine from a formulary compiled by many learned hands. If, following the prescriptions of this sacred book (*Embre*), they fail to save the patient, they are absolved from all guilt; but if they run counter to its directions, they are put to death; for the lawgiver opined that few physicians are more competent than a system tested by time and compiled by the best.

As to the organization of the medical profession in Egypt, both Homer and Herodotus are in agreement. In the *Odyssey* (iv, 231-232) occurs the verse:

"There every physician excels all other men in [his particular] knowledge; for truly, they are of the race of Pacon."⁹

⁶ Sudhoff: Internationale Hygiene-Ausstellung, Dresden, 1911, i, Historische Abteilung, 34-41 (items 1101-1632).

⁷ Forbin: *Les jouets dans la tombe*. Nature, Paris, 1921, 53-59.

⁸ H. G. Wells: *Outline of History*. London, 1921, i, 119-162.

⁹ Frélich cites the Voss translation of this Homeric verse, with the reading—

"Dort ist jeder ein Arzt und übertrifft an Erfahrung

Alle Menschen: den wahrlich sie sind von Geschlechte Pacons."

which is erroneous. If we may trust Herodotus, the essential feature of Egyptian medicine was a specialist for every disease or group of diseases, while every man as a self-appointed doctor (*jeder ein Arzt*) was characteristic of Assyro-Babylonian medicine.

Herodotus says (ii, 84):

The art of medicine is thus divided among them; each physician applies himself to one disease only, and not more. All places abound in physicians; some are for the eyes, others for the head, others for the teeth, others for the parts about the belly, and others for internal disorders.

The Egyptians were natural chemists, and had a most extensive pharmacopœia, with weighing of drugs by the balance; but their extreme specialism of "a doctor for every disease," or at least for each part or region of the body, could only result in haphazard therapy. The Ebers Papyrus (1550 B. C.) shows them at their best, in their knowledge of the hookworm and other parasitic affections, of diseases of the eye and ear, of the treatment of tumors and abscesses by the knife, and of the art of embalming. Trephining was common, as among all ancient and primitive peoples. Larrey, in his *Memoirs*, states that the mural paintings and bas-reliefs in the temples at Karnak, Luxor, etc., afford abundant evidence of the methodical practice of surgery by the ancient Egyptians.¹⁰ Circumcision and other phases of genito-urinary surgery are clearly depicted on a tomb at Saqqarah, near Memphis (2500 B. C.). Egyptian surgery was essentially external and rudimentary; their knowledge of anatomy was small. The instruments found are usually of the Bronze Age; but Plate II in the great album of Lepsius represents sword-blades, spear and arrow points as painted blue, which suggests perhaps some knowledge of the tempering of iron into steel (Frölich). The mummies excavated in Nubia in 1907, prior to the flooding of the Assuan Dam, show splinting of fractures by means of palm-fiber bandages, with surprisingly good results and little shortening.¹¹ This technique was the origin of the art of bandaging, which was highly elaborated by the Greeks and Romans, and to which Oribasius (325-403 A. D.) devoted no less than seventy chapters. A stele of the Eighteenth Dynasty (1580 B. C.) in the Carlsberg Glyptothek (Copenhagen) shows the use of a crutch in an obvious case of poliomyelitis. The mummies show that syphilis, cancer and rickets were non-existent, teeth were uniformly good and free from caries, rheumatoid arthritis was of staggering frequency from youth to old age, even in the latest dynasties, while Pott's disease (21st Dynasty, 1000 B. C.), spondylitis deformans, gout, malarial spleen, atheroma of the arteries, mastoid disease, pleural and visceral adhesions, necrosis and cranial injuries from blows and sword-strokes have been found.¹²

¹⁰ D. J. Larrey: *Mémoires de chirurgie militaire*, Paris, 1812, ii, 223.

¹¹ For photographs of which, see G. Elliot Smith and F. Wood Jones: *The Archaeological Survey of Nubia*, Cairo, 1910, Atlas to Vol. ii, *passim*.

¹² Elliot Smith: *op cit.*, Vol. ii; also Sudhoff: *Dresdeo Catalogue*, 1911, 52-53 (items 1633-1715).

Sumer and Akkad

(Assyro-Babylonian Civilization)

Between the Tigris and the Euphrates lay the ancient "kingdom between the rivers" (Mesopotamia), originally occupied by the mysterious Sumerians, the originators of our decimal system of notation, our ordinary divisions of time, and the art of writing on clay tablets. On account of their enormous wheat yield (Herodotus, i, 193), these fertile plains were to be the seat of endless wars, in the course of which a mighty civilization of some 5,000 years standing was gradually built up. The Sumerians were conquered by the Semitic Akkadians under Sargon (2750 B. C.), but, in keeping with the anthropological law of Lapouge,¹³ the conquerors were assimilated by the conquered people, and the old Sumerian culture prevailed. In 2100 B. C. all Mesopotamia was mastered by the Amorites under Hamurabi, whose capital was Babylon. Babylonia then fell successively under the domination of the Assyrians under Tiglath Pileser I and III (1100 B. C.; 745 B. C.), with an additional capital at Nineveh; of the Medes and Persians under Cyrus (539 B. C.); and of the Greeks under Alexander the Great (331 B. C.).

In spite of this constant change of military masters, the Assyro-Babylonian culture continued to have a natural growth and development up to its inevitable decadence. These wonderful people did much for the development of astronomy, had splendid drains and sewers,¹⁴ stone privies, slipper-shaped coffins and fan-shaped tombs, an organized system of wet-nursing, long lists of injurious insects and parasites, parasols against the heat, fly-flaps against insect pests, hollow tubes for sipping beverages, water-wings to teach swimming,¹⁵ and knew the Australian crawl. They had a highly organized military service, with chariots, archers, light cavalry and infantry tactics in close phalanx formation. As their imposing bas-reliefs indicate, a large part of the service of their defensive arm was taken up with organized warfare on wild animals. In prehistoric times, the larger animals of the cat family were plentiful all over Europe, as well as in Asia and Africa. Lions existed in Germany up to the Neolithic period, in the Balkans up to the fourth century B. C., while the panther was common in Greece, Southern Italy and Spain up to 1000 B. C., and was usually figured in Bacchic processions on Greek pottery of the later periods. Extermination

¹³ "La terre est restée partout aux descendants de ceux qui la cultivaient et ne garde plus que les os de la race supérieure qui l'ensanglantait." G. de Lapouge: *Rev. d'anthrop.*, Par., 1887, xvi, 524.

¹⁴ For the sewage and water-supply of the cities of antiquity, see, H. A. Nielsen: *Arch. f. Hvg.*, Berl., 1902, xliii, 85-115.

¹⁵ Sudhoff: *Dresden Catalogue*, 1911, 21-28 (items 601-1047).

of these beasts was effected, not by change of climate but by man.¹⁶ Some of the finest and most realistic of the Assyro-Babylonian bas-reliefs represent lions transfixcd by spears, in the agony of death, with spirited scenes of the destruction of wild beasts by archers and spearmen in chariots or on horseback. The demons of Assyro-Babylonian mythology were usually represented as lion-headed. An ancient carved limestone pillar of the Sumerian period (2920 B. C.), found at Telloh and known as the Stele of the Vultures, shows helmeted warriors with extended spears marching in phalanx formation over the bodies of their enemies; another detachment with spears at "right shoulder arms," headed by the king in a chariot; the god Ningirsu capturing the enemies of Lagash in a net; the burial of the soldiers of Eannatum in a common trench, with policing of the battlefield by vultures.¹⁷

An Assyrian bas-relief shows the transportation of a gigantic stone image by gang laborers hitched to a truck and urged on with whips. A bas-relief from Nineveh shows a walled camp, with drinking, bed-making and slaughtering of animals in tents.¹⁸

The essential features of Assyro-Babylonian medicine were a demon for every disease (our disease germs), prognosis by liver inspection and therapy by exorcism and herbal remedies. Contagion was seizure by demons; incantation was prophylaxis. Conjurations against mosquitoes have been found, and the symbol of Nergal, the Mesopotamian god of disease and death, is a fly. The ancient Babylonian custom characterized by Montaigne as "the whole people as physician" is given in Herodotus (i, 80):

They bring out their sick to the market place, for they have no physicians. Then those who pass by the sick person confer with him about the disease, to discover whether they have themselves been afflicted with the same disease as the sick person, or have seen others so afflicted; thus the passers-by confer with him, and advise him to have recourse to the same treatment as that by which they escaped a similar disease, or as they have known to cure others. And they are not allowed to pass by a sick person in silence, without inquiring into the nature of his troubles.

This Main Street variety of communal medicine and group diagnosis implies, however, that some of these self-appointed physicians were more highly skilled than the rest. As a matter of fact, a number of letters by court physicians to Assurbanipal (884-860 B. C.) on clinical cases have been deciphered. In the Code Hammurabi (2250 B. C.), the statutory fees of physicians are carefully indicated in particular cases, as also the penalties for malpractice; e.g., in setting a fracture or operating for cataract. Like Egypt, Babylonia was a matriarchal

¹⁶ Sir H. H. Johnston: footnote to p. 192 of Wells' Outline of History, Lond., 1921, i.

¹⁷ For a reproduction of this stele, see Morris Jastrow: *The Religion of Babylonia and Assyria*, Phila., 1915, pl. xlvii-xlviii.

¹⁸ Sudhoff: *Dresden Catalogue*, items 758-760.

civilization, and there are no comelier figures in sculpture than those representing the mother-goddess Ishtar suckling a child. The rights of wives, widows and children, including orphans and adopted children, were scrupulously protected by severe penalties in the Hammurabi Code.

The caduceus as the symbol of the Mesopotamian god of fertility (Ningishzida) is found on a green steatite vase from Telloh (4000-3000 B. C.), now in the Louvre. This symbol was later assimilated by the Greeks as the emblem of Mercury, the god of commerce, and by the Romans as a badge of secrecy and neutrality, with a special herald, the *caduceator* or peace commissioner, for the conduct of peaceful negotiations in war time. Varro called the caduceus "the symbol of peace,"¹⁹ and the fact that it connotes transactions of this character probably led to its adoption as a symbol of the non-combatant status of the American medical officer and his rights in the zone of advance in war-time, under the Geneva Convention.²⁰

As in Greece or Rome, there were elements of darkness, blood-guiltiness and cruelty in Egypt and Babylon, but probably not more than in the extensive holocaust of religious martyrs and free-thinkers in the sixteenth century, or, scattered over a wider surface, on the police-blotters of the larger cities of the world today.

Israel

The wars of the Jews occupy no inconsiderable portion of the Old Testament, the Apocrypha and the writings of Josephus; the Hebraic contribution to military hygiene is an essential part of their remarkable work in the early development of preventive medicine. In connection with the sojourn in Egypt and the Babylonian Captivity (587-537 B. C.), the Hebrews undoubtedly acquired much from these ancient civilizations and were perhaps influenced in a later period by the convection of culture from Greece. In the modern view, Moses as the hygienic shepherd of his people (*circa* 1491 B. C.) is only a symbol for the finished product of Sumerian-Semitic cult-hygiene (as set forth in the Pentateuch), after a long period of gradual development. Circumcision was originally a primitive ethnic (Egyptian) rite,²¹ like clitoridectomy, "which to date has not been proclaimed a hygienic measure;" and "even ritual uncleanness of women under special circumstances, is ancient property of Greece" (Sudhoff).²²

But the Hebrews did do a number of very important things for the

¹⁹ "Caduceus pacis signum." Varro: *De vita populi Romani*, lib. ii.

²⁰ F. H. Garrison: *Bull. Med. Library Assoc.*, Balt., 1919, ix, 13-16, also; *MILITARY SURGEON*, Wash., 1919, xlv, 633-636.

²¹ *Jewish Encyclopædia*, N. Y., 1903, iv, 96-97.

²² Sudhoff. *Ann. Med. History*, N. Y., 1917-18, i, 114.

ethical and hygienic well-being of civilized man which cannot be attributed to Sumner and Akkad. First of all, the best features of their moral code, whether of the Old or the New Testament, are intimately connected with clean living and constitute a touchstone of all ultimate refinement of human character. Their prophets developed that spirit of outspoken indignation against social injustice which Wells calls "the free conscience of mankind" and which, however latent or apparent in Æschylus and Sophocles, was a new thing in antiquity and was not a salient trait of the Hellenes. They introduced the weekly day of rest as a splint for overworked humanity, a hygienic idea of fundamental importance, and they early recognized certain diseases as communicable and took effective measures to prevent them. The book of Leviticus (xiii-xv) is thus the basic text of a phase of preventive medicine which was absolutely unknown to the Greeks. The Jewish priests were true hygienic police, supervising the segregation of lepers and venereal carriers, but physicians were a class apart, and there is no evidence that priests ever attended individual cases of illness. In the Assyro-Babylonian cult, as Sudhoff tells us, "whoever was defiled by *issubu* (leprosy) was banished into the wilderness . . . but in the Old Testament (Leviticus xiii), we have the methodic investigation of the leper by the priest, who, according to the diagnosis, isolated the patient temporarily, or permanently."²³ The external signs of leprosy are given in minute detail in verses 2-44; an ascertained leper was expelled from the community (44-46), condemned to civil death, his clothes were burned, if contaminated (47-52), or washed, if not (53-59), while a suspected house was closely examined and, if contaminated, was destroyed (Lev. xiv, 34-53). The fifteenth chapter of Leviticus, dealing with the "uncleanness" of men and women "in their issues," exacts the same rigid regimentation in cases of urethritis (gonorrhœal or other). The plague of Baal Peor, caused by sexual intercourse with the Midianitish women (Numbers xxv), was followed by a Sicilian Vespers of Midianites, which, after the fanatical fashion of antiquity, was extended to all males and to all females who were not virgins (Num. xxxi). "Purification" (disinfection) in the Mosaic ritual was accomplished by the use of fair water, or by a mixture of "cedar wood (juniper), scarlet and hyssop," or by actual incineration (Lev. xii-xv, *passim*).

In the sanitary regulation of diet and water supply, Leviticus xi and Deuteronomy xiv are again extraordinarily forward. Prehistoric and primitive man, like the infant, was apt to swallow everything that seemed edible, with the same untoward results which Celsus noted in the evolution of dietetics in disease. The Mosaic code pronounced as

²³ Sudhoff: *op. cit.*, 115.

edible all ruminant animals with cloven hoofs (herbivora), all fish with fins and scales, all birds not feeding upon carrion, while ordinary ungulates and tardigrades, poisonous fish (devoid of fins and scales), all creeping things (reptiles and batrachians) and all unclean birds were rigorously prohibited, as also any water touched by their carcasses (Lev. xii, 3-43). Fat and blood were taboo (Lev. vii, 26; xix, 26), and it was forbidden to "eat of anything that dieth of itself" (Lev. xi, 9) or "any flesh that is torn off beasts in the field" (Exodus xxii, 31). Water or utensils contaminated by dead or unclean animals could not be used (Lev. xi, 32-39), and any open, uncovered vessel in a tent containing a corpse was regarded as unclean (Num. xix, 14, 15).²⁴ Here, then, we have a highly effective scheme of sanitation for hot climates, which was never observed or recorded by the Greeks and the Romans. The same intelligence and forethought is apparent in the remarkable passage in Deuteronomy (xxiii, 9-14) on the policing of a military camp:

9. When the host goeth forth against thine enemies, then keep thee from every wicked thing.

10. If there be among you any man that is not clean by reason of uncleanness that chanceth him by night, then shall he go abroad out of the camp, he shall not come within the camp.

11. But it shall be, when evening cometh on, he shall wash himself with water; and when the sun is down, he shall come into the camp again.

12. Thou shalt have a place also without the camp, whither thou shalt go forth abroad;

13. And thou shalt have a paddle upon thy weapon; and it shall be when thou wilt ease thyself abroad, thou shalt dig therewith, and shalt turn back and cover that which cometh from thee;

14. For the Lord thy God walketh in the midst of the camp, to deliver thee and to give up thine enemies before thee; therefore shall thy camp be holy; that he see no unclean thing in thee, and turn away from thee.

Austere rulings of the same kind obtained for the enforcement of exogamy and the punishment of sexual perversions, incest, bestiality, and adultery (Lev. xviii; Exodus xxii-xxiii), and these chapters are the literary origins of medical jurisprudence.

The census of the people by Moses (Num. i, 1-4, xxvi, 1-65) and by Joab at the instance of David (I Chronicles, xxi, 3-7) had the usual military significance, viz., to ascertain the available man-power of the nation for war.

In the Babylonian Talmud (352-427 A. D.), the presence of an infectious disease in a community was announced by a warning blast of the shofar, but in the case of diphtheria (*askara*, *εσχάρα*) this was done directly the first case was located, on account of the fatal incidence of

²⁴ For a readable account of Mosiac hygiene see the book by Capt. Percival Wood, R. A. M. C., entitled, "Moses, The Founder of Preventive Medicine." London, 1920

the disease among infants and children.²⁵ The Talmudic regulation of meat inspection, in connection with the slaughtering of animals, was an extension of the Mosaic cult of "clean" (*kosher*) and "unclean" (*trepha*). It is highly probable, as Sudhoff maintains, that the hygienic supervision of meat diet owes its origin to primitive altar practices, i. e., the determination of what rejects of sacrifice were fit to be eaten or otherwise, and from this "sacrificial anatomy" (*Opferanatomie*) the culinary or "butcher's anatomy" of the Middle Ages was also derived. The autopsies made in the Hebrew ritual, after the *Schächter* had slaughtered the animal, were destined, incidentally, to be the source of many observations in comparative pathology in the Talmud,²⁶ indeed, the only recorded observations in gross pathology before the time of Benivieni and Vesalius. The curious awe and fear of the dead human body, which is characteristic of early and primitive peoples everywhere, prevented the ancients from doing any scientific work in human anatomy and pathology, even as the second commandment interdicted the art of sculpture among the Jews.

The strong prejudice of antiquity against the opening of the human body, living or dead, is conveyed to us with sly humor by Celsus. The passage is worth quoting in full as showing just how the ancients acquired their slender knowledge of human anatomy:

Nor can anything be more absurd than to suppose the part to be the same in a dying man, nay, already dead, as it is in a living person. The abdomen may be laid open, it is true, even while the man is breathing (which does not strictly bear on the case); but as soon as the knife has separated the *praecordia* and the diaphragm, the man immediately expires; consequently, the *praecordia*, and all the viscera, present the same appearances to the slaughtering physician as those of a dead person, not such as they were while he lived; therefore the only object attained by the physician is that of murdering a man cruelly; not that he can ever ascertain their nature and functions as we have them in life; yet if there be any interesting phenomenon to be subjected to the view in the man as yet breathing, practitioners have frequent opportunities of meeting them by accidents; for sometimes the gladiator in the arena, a soldier in the field, or a traveller intercepted by banditti, is wounded in such a manner as to display some of the interior parts, and so, other parts in other persons. Thus the prudent physician discovers their structure, relative position, arrangement, figure and the like, not by perpetrating murder, but in endeavoring to restore health; and learns by compassion what others have discovered by unrelenting cruelty. And for these reasons [I consider it] unnecessary to lacerate even the dead, which, though not cruel yet may be disgusting; since most things are found very different in dead bodies; even the dressing of wounds themselves may show all that can be discovered in the living.²⁷

²⁵ J. Preuss: *Biblisch-talmudische Medizin*. Berlin, 1911, 179.

²⁶ C. D. Spivak: *Jewish Encyclopædia*. N. Y., 1904, 412-413.

²⁷ Celsus: *De re medica*. Prooemium. Transl. by A. Lee, London, 1831, 13-14.

India

In ancient India, medicine was a matter of incantations against disease and injury, with a certain amount of herbal therapy. The quality of this primitive medicine may be sensed from a few of the titles of hymns in Professor Whitney's *Atharva Veda*, e. g.:

Against obstruction of urine, with a reed; against leprosy, with a healing herb; for welfare and long life of an infant; against worms; a blessing on the kine; to avert the ill omen of a twinning animal; for recovery of virility, with a plant; against the poison of a poisoned arrow; to heal serious wounds, with an herb; for deliverance from unseen pests; for successful pregnancy, with an amulet; against harm from improper food; to get rid of cough; to make a certain man impotent; against poison of insects and snakes; against intermittent fever, etc.

As apparent from the above, the treatment of wounds in war is mentioned even in the earliest Vedic hymns, the epics (*Ramayana*), and the medical texts. In the medical treatise of *Susruta* (4th Century, B. C.) there is a chapter on "the mode of preserving the life of a king whose soldiers are on the march," from which the following paragraphs may be quoted:

A common practice of the enemy under such circumstances is to poison the wells on the roadside, the articles of food, the shades of trees (shadowy places) and the fuel and forage for cattle; hence it is incumbent on a physician marching with the troops, to inspect, examine and purify these before using any of them, in case they be poisoned.

Physicians conversant with the curative virtues of drugs and minerals, and priests well versed in the Vedic Mantras, should jointly protect the king from death, whether due to idiopathic (*Doshaja*) or extrinsic causes.

The death of a king usually leads to a political revolution or to popular disturbances and brings about a confusion among the vocations of the different orders of society. The growth of population markedly suffers through such catastrophes.

A physician, fully equipped with a supply of medicine, should live in a camp not remote from the royal pavilion, and there the persons wounded by shafts of arrows or any other war projectiles, or suffering from the effects of any imbibed poison, should resort to him (the physician), conspicuous like a triumphant ensign for his fame and professional success. A physician, well versed in his own technical science, and commanding a fair knowledge of other allied branches of study as well, is glorified by his kind and the Brahmanas, and is, like a banner of victory, an ennobling ornament to the state.

The (proper) medicine is that which consists of drugs grown in countries most congenial to their growth, collected under the auspices of proper lunar phases and asterisms, and compounded in proper measures and proportions, and which is pleasing (exhilarating to the mind) and has the property of subduing the deranged bodily humours without creating any discomfort to the patient, and which is harmless even in an overdose, and is judiciously administered at the opportune moment.

That person alone is fit to nurse or to attend the bedside of a patient, who is cool-headed and pleasant in his demeanour, does not speak ill of anybody, is strong and attentive to the requirements of the sick, and strictly and indefatigably follows the instructions of the physician.²⁴

²⁴ *Sushruta Samhita*, English translation by K. L. Bhishagratna. Calcutta, 1907, i, 303-307.

Indian medicine reached its height in the period 327 B. C.-750, A. D. the period of Buddhism, which became the creed of India under King Asoka (264-227 B. C.). In 255 B. C., Asoka conquered Kalinga, acquired dominion over the vast peninsula of Hindustan, renounced war, converted his subjects to Buddhism, and ruled for twenty-eight years "in light and gentleness." (Wells.) He had innumerable wells dug, great shade-trees planted, founded botanic gardens for the cultivation of medicinal herbs and, as a rock-inscription records, erected hospitals, both for men and animals. Buddhism was more favorable to the arts and sciences than the narrow caste prejudices and sterile formalities of Brahmanism. In 161 B. C., a dying monarch records that he established hospitals in eighteen different places. The Indian materia medica, dietetics, surgery, with the rules for the hygiene and nutrition of infancy were the best in this period of antiquity. The surgical instruments, over 120 in variety, were well sharpened as to edge and point, and every important operation was done except the ligation of arteries. The Hindu methods of rhinoplasty and cataract excision were carried all over Europe by the wandering surgeons of the Middle Ages. The Indian mode of splinting fractures with bamboo withes was adopted in the British Army as the "patient rattan cane splint." The soporific effects of opium, hyoseyamus, and cannabis indica were known. Hypnotism was also employed in surgical operations. Surgery was taught by having the students practice swiftness and surety of incision upon gourds, melons, lily stalks, etc.; bandaging was practised upon flexible models, and venesection was learned by puncturing the veins of large green leaves. The Hindus were aware that mosquitoes were somehow associated with the transmission of fevers, that when rats fall from the rafters, jump about and die, bubonic plague is at hand. Mosquito nets were used on the Coromandel Coast. Diabetes was recognized by the Indian physicians as *Madhumeha* (honey-urine), while the syndrome of sweetish urine, thirst, foul breath, and debility was recognized later by the Arabians. There is abundant evidence that the Indian and Arabian physicians were specialists in diabetes and hepatic disorders.

Hellas

With the exception of the Spartan State, the Greeks were a brave and warlike rather than a strictly military people. Greece was a loose federation of independent city states, each with its own peculiar religious ideas and form of government. Scattered on the innumerable islands and peninsulas and separated (in the hinterland) by abrupt mountain walls, these city states were frequently at odds with one another, but united on occasion against a common enemy (Confederated

Hellas). Here they showed unparalleled courage, devotion and patriotism, but their real contribution was the development of liberty of thought in mankind. They were the most intelligent people the world has ever seen, never equalled since in their achievement in art and science, including the purest strain of medicine we know.

To understand the Greeks, to know why they are to be placed above all other peoples, one may well consider the illuminating appraisal furnished by Professor Gilbert Murray for Wells' Outline of History. Their outer political history, he points out elsewhere, "like that of all other nations, is filled with war and diplomacy, with cruelty and deceit," but with almost no experience or material resources, with "clothes like Polynesians," with poor tools and no instruments of precision, they boldly ventured upon new and untried paths, like some penniless, friendless youth of genius who does great things unawares.

The greatness of Greece comes out only in the art and literature and thought. . . . Also, an actual achievement in social life—what one calls "Hellenism," i. e., republicanism, simplicity of life, sobriety of thought, almost complete abolition of torture, mutilation, etc., and an amazing emancipation of the individual and of the human intellect. It is impossible to speak, really, of the "Greek view" of anything. Because all the different views are put forward and represented. . . . The characteristic is that *human thought got free*. . . .²⁹

It is an outstanding fact that the Greeks of highest genius, including every one of their greatest physicians, came from the coastwise colonies of Ionia and the outlying islands. While Pericles, Themistocles, Sophocles and Phidias were seafaring Athenians and Æschylus and Thucydides came from Attica, Plato and all the great philosophers before him were Ionian islanders, as also the other men of outstanding ability.³⁰ This is readily understandable when we consider the known passion of island, coastwise, seafaring and mountaineering peoples for personal, intellectual, political and spiritual liberty. The Ionians were, as Allbutt says, "the young light-hearted masters of the waves,"³¹ whose modes of thought were

"Something afar from a pious and puny life,
Something escaped from the anchorage and driving free."

Ethnically, the Greeks were made up of a dominating element of Nordic strain, the original Dorian invaders of the North who produced the splendid warriors and athletic prizemen, and a smaller, darker,

²⁹ Wells: Outline of History. London, 1921, i.

³⁰ For the long list of Ionian physicians and philosophers, see Allbutt: Greek Medicine in Rome, London, 1921, 83-112.

³¹ Matthew Arnold: The Scholar-Gypsy.

Mediterranean or Neolithic race, of livelier imagination and, at the same time, of more superstitious mentality, "afraid," as Wells says, "of the stars and of life." From this fusion there came to be two distinct and separate phases of Greek medicine, the one harking back to primeval superstitions connected with theurgy, Chaldean astrology, the gods of the underworld, Thessalian charms, magic and charlatanry; the other forward-looking, keen-sighted, absolutely rational, and, aside from an inveterate passion for speculation, scientific in tendency.

In the island of Crete, some three or four thousand years before Christ, there existed a civilization extraordinarily advanced in many respects, which illustrates this dualism. The excavations made by Sir Arthur Evans suggest a culture as elaborately specialized as those of ancient India or Japan. The porcelain figures of the mother goddess, with her votaries, clad in gowns of amusingly modern cut, grasp serpents with outstretched arms, like Hopi Indians "making medicine." On the other hand, the ventilation, sewage piping, bathrooms, stone water-closets³² and other sanitary arrangements of the palace at Knossos (the Cretan Labyrinth) are said to excel anything of the kind before the nineteenth century. Knossos fell before the northern invaders about 1400 B. C., and it is now assumed that the leading motive in the Trojan War is the usual *fable convenue*, superimposed upon the main events of the general Dorian invasion, about which the Iliad and other ancient epics were built up.

In the Iliad and Odyssey of Homer, the most splendid of all folk epics, we have, at one and the same time, the view of epidemic diseases as visitations of the wrath of the gods, of the necessity of human sacrifice to placate the spirits of the uncremated dead, alongside of a war surgery of absolutely rational type. There is only one passage in Homer (Odyssey xix, 456-457) in which a charm or incantation is chanted over a wound, and its object, to check hæmorrhage, was, curiously enough, the object of scores of similar folk charms in the Dark and Middle Ages. Frölich, who wrote under the spell of Schliemann's excavations in the Troad, was ridiculed by some of his contemporaries for making an elaborate statistical tabulation of the war-wounds in the Iliad; but, if we reflect that no less than 147 wounds are recorded in the great epos, his percentages are at least as reliable as what the mathematical laws of probability would obtain from 147 throws of dice. Of these 147 wounds, 106 were spear wounds, with a fatality of 1 out of every 1.25 cases; 17 sword thrusts, with total mortality; 12 arrow wounds with 1:2.4 mortality; and 12 wounds from stone-slings with 1:1.5 mortality.

³² For an account of which see the article by Capt. T. H. M. Clarke, R. A. M. C., in *Brit. Med. Jour.*, Lond., 1903, li, 597-599.

The total mortality was 114 or 77.6 per cent, and of these fatalities 31 were head wounds, 13 injuries of the neck, 67 chest wounds, 10 and 11 wounds of the upper and lower extremities respectively. This is about what we should expect from wounds with *armes blanches*, with no operative treatment. As shown by Frölich's tabulation, the relative percentile frequency of the Homeric wounds in different localities as compared with the incidence of his own time (1879) was: Head 21 per cent; 7 per cent; neck 11:2; chest 54:21; upper extremities 7:26; lower extremities 7:44.³³

The old Ionian word for physician (*ιητρος*), as employed by Homer, meant originally "an extractor of arrows." The war surgery of the Iliad was what the mediæval peoples called wound surgery—i. e., expectant treatment of wounds—and was carried out by a number of regular surgeons (Iliad xiii, 213; xvi, 28), and by certain warrior chieftains (Machaon, Podalirius, Achilles, Patroclus, Agenor) who were adept in wound treatment. The battle formation described in the Iliad (iv, 297) was of the phalanx order, with infantry in the rear, horsemen and charioteers in the front line, and "cowards in the middle." Battles began with individual skirmishing and trial combats, the horse and chariots going to the rear before an infantry assault, but taking the front line in a general advance. After the fashion of primitives, a wounded hero was dragged or borne out of danger by his comrades, sometimes placed under a tree to die (v, 693), but was usually taken to a chariot (xiv, 429), which bore him to the *klisia*³⁴ or hut-like barracks near the black ships (xi, 517; 834). Here he was given a stimulating draught of wine, the "wound-drink" of the Middle Ages (xiv, 5), his clothing was loosened in the region of the wound (iv, 215), which was then washed with warm water (xi, 829; xiv, 6-7) and, if necessary, further examined (iv, 190). An imbedded spear or arrow-point was either withdrawn (v, 112; 693) or cut out by widening the wound (xi, 844). The wound was then treated with various herbs relieving pain (iv, 191, 218, etc.) or with the juice of some bitter root (xi, 846), and finally bound up with a woolen bandage (xii, 599). In one instance, Machaon sucks out the blood after extracting an arrow from Menelaus (iv, 218),³⁵ a practice which was to survive even down to the days of the "wound-suckers" who followed duellists in the eighteenth century.

A fair specimen of this wound surgery is the treatment of the arrow wound of Eurypylus by Patroclus (xi, 834-847):

³³ Frölich: Die Militärmedizin Homer's. Stuttgart, 1879, 58-60.

³⁴ Usually translated "tents," but, as Frölich shows, these "tents" are always described as "well-built" and were in fact, constructed of hewn lumber, with thatched roofs. A closer translation would probably be "huts."

³⁵ Frölich: *op. cit.*, *passim*.

He said, and having laid hold of the shepherd of the people under his breast, bore him to the tent, and his attendant, when he saw him, spread under him bulls' hides. There Patroclus, laying him at length, cut out with a knife the bitter sharp arrow from his thigh, and washed the black blood from it with warm water. Then he applied a bitter pain-assuaging root, rubbing it in his hands, which checked all his pangs; the wound, indeed, was dried up and the bleeding ceased.

Legendary as all this is, it was about the standard procedure followed in ordinary wound treatment up to the changes necessitated by the introduction of firearms in the Middle Ages.

The epidemic visited upon the Grecian host by the wrath of Apollo, attacking both mules and men, was probably dysentery, which has been endemic in the Mediterranean basin for centuries, was described by Hippocrates, and in 1915 "destroyed mules and many thousands of our men in Gallipoli, just across the Hellespont from Troy" (Edgeworth).³⁵

The next most important sources for the military medicine of the Greeks are the writings of Hippocrates and Herodotus, and of the dim and distant background which these great names imply, Sir Clifford Allbutt says in his "Greek Medicine in Rome:"

It is no barren fancy to associate the Father of Medicine in our imagination with the Father of History. Both inherited the luminous Ionian mind; and the author of *Airs, Waters and Places*, cradled on the same enticing seas, had likewise travelled widely and observed shrewdly; both saw common things under the species of a large humanity. Indeed, the Hippocratic scriptures themselves thus testify to some great school and tradition of medicine, which, sown and watered in a forgotten and unrecorded past, bore ultimately its golden fruit in the great master himself, and onwards in Aristotle and the scientific schools of Alexandria.³⁷

Over five hundred years intervened between the time of Homer and the advent of Hippocrates, whose authentic writings are, in effect, a summation of what was accomplished by Greek medicine in this long period of "silence in the records." Open the true Hippocratic canon almost anywhere and you will light upon clean-cut reasoning like this, sentences which we, 2400 years later, are pleased to regard as "modern" in tendency:

PHYSICIANS AS GOOD AND BAD ACTORS

Medicine is of all arts the most noble; but, owing to the ignorance of those who practice it and of those who, inconsiderately form a judgment of them, it is at present far behind all the other arts. Their mistake appears to me to arise principally from this that in the cities there is no punishment connected with the practice of medicine (and with it alone) except disgrace, and that does not hurt those who are familiar with it. Such persons are like the mimes or dummy figures introduced in tragedies, for as they have the shape and dress and personal appearance of an actor, but are not actors, so also physicians are many in title but few in reality.—*The Law*.

³⁵ F. H. Edgeworth: *Bristol Med.-Chir. Jour.*, 1916, xxiv, 115.
Allbutt: *Greek Medicine in Rome*. London, 1921, 180.

DIVINE ORIGIN OF EPILEPSY

And they who first referred this disease to the gods appear to me to have been just such persons as the conjurors, purificators, mountebanks and charlatans now are, who give themselves out for being excessively religious and as knowing more than other people. Such persons, then, using the divinity as a pretext and screen of their own inability to render any assistance, have given out that the disease is sacred, adding suitable reasons for this opinion. . . . But this disease seems to me no more divine than others; but it has its nature such as other diseases have, and a cause whence it originates, and its nature and cause are divine only just as much as all others are, and it is curable no less than the others, unless when, from length of time, it is confirmed and has become stronger than the remedies applied. Its origin is hereditary, like that of other diseases.—*On the Sacred Disease*.

FIGHTING QUALITIES OF FREE AND ENSLAVED PEOPLES

Monarchy prevails in the greater part of Asia, and where men are not their own masters nor independent, but are the slaves of others, it is not a matter of consideration with them how they may acquire military discipline, but how they may dodge the responsibilities of valor; for the dangers are not equally shared, since they must serve as soldiers, perhaps endure fatigue, and die for their masters, far from their wives, children and friends; and whatever noble and manly actions they may perform lead only to the aggrandizement of their masters, whilst the fruits which they reap are dangers and death. . . . Thus, then, if any one be naturally warlike and courageous, his disposition will be changed by the institutions. As a strong proof of all this, such Greeks or Asiatic barbarians as are not under a despotic form of government, but are independent and enjoy the fruits of their own labors, are of all others the most warlike; for these brave danger on their own account, bear the prizes of their own valor, and, in like manner, endure the punishment of their own cowardice.—*Airs, Waters and Places*, 16.

SANITARY SURVEY OF A LOCALITY

When one comes into a city to which he is a stranger, he ought to consider its situation, how it lies as to the winds and the rising of the sun . . . and concerning the waters which the inhabitants use, whether they be marshy and soft, or hard, and running from elevated and rocky sites, and then if salty and unfit for cooking; and the ground, whether it be naked and deficient in water, or wooded and well watered, and whether it lies in a hollow, confined situation, or is elevated and cold; and the way in which the inhabitants live, and what are their pursuits; whether they are fond of eating and drinking to excess, and given to indolence, or are fond of exercise and labor and not given to gluttony and drunkenness. From these things he must proceed to investigate everything else. For if one knows all these things well, or at least the greater part of them, he cannot miss knowing when he comes into a strange city, either the diseases peculiar to the place or the particular nature of common diseases. . . . And, in particular, as the season and the year advances, he can tell what epidemic diseases will attack the city, either in summer or winter.—*Airs, Waters and Places*, 1.

THE PRACTICE OF MEDICINE

The physician must have two special objects in view with regard to diseases viz., to do good or to do no harm. The art consists in three things—the disease, the patient and the physician. The physician is the servant of the art and the patient must combat the disease along with the physician.—*Epidemic Diseases*, I, 5.

SIGNS OF APPROACHING DEATH

The gravest are the following: a sharp nose, hollow eyes, collapsed temples, the ears cold, contracted, with lobes turned out; the skin about the forehead rough, distended and parched; the color of the whole face green, black, livid, or lead-colored. . . . It is a mortal symptom, also, when the lips are relaxed, pendent, cold and blanched. . . . When in acute fevers, pneumonia, phrenitis or headache, the hands are waved before the face, hunting through empty space, as of gathering bits of straw, picking the nap from the coverlid or tearing chaff from the wall—all such symptoms are bad and deadly.—*Prognosis*, 2.

RESPIRATION IN DISEASE

Respiration, when frequent, indicates pain or inflammation in the parts above the diaphragm; a large respiration, performed at wide intervals, announces delirium; but a cold respiration at nose or mouth is a very fatal symptom. Free respiration is to be looked upon as contributing much to the safety of the patient in all acute diseases.—*Prognosis*, 5.

CHEYNE STOKES RESPIRATION IN A FATAL CASE

The breathing throughout, like that of a person recollecting himself, was rare and large.—*Epidemic Diseases*, I, 13.

CLINICAL APHORISMS

- Use the lightest diet at the height of an acute disease.
- Slop diet is suitable in all febrile diseases, particularly in children.
- Labored sleep in any disease is a bad sign.
- Sleep following upon delirium is a good sign.
- Spontaneous lassitude indicates disease.
- Insensibility to great local pain shows that the mind is affected.
- Liquid diet is better for emaciation than solid.
- Never work when hungry.
- Overeating brings on illness, as shown by the treatment.
- Old persons have fewer diseases than the young, but chronic diseases never leave them.
- Very fat persons are apt to die earlier than the slender.
- Sandy sediment in the urine means vesical calculus.
- Blood or pus in the urine points to erosion of the bladder or kidneys.
- Spasm supervening on a wound is fatal.
- Epistaxis in amenorrhœa is good.
- Induration of the liver in jaundice is bad.
- Spinal deformity often coexists with cough and tubercle of the lungs.

Here we have something utterly different from the chaotic rumble bumble of Mesopotamian and Egyptian medicine and something not to be explained by the three thousand years intervening, namely, the free play of a great mind. The Hippocratic descriptions of phthisis, epidemic mumps, epilepsy, the malarial fevers and puerperal convulsions could go without change into any text-book and nothing quite so close to fact was recorded again before the Renaissance, 2,000 years later. Hippocratic surgery is mainly orthopedics and wound surgery. The Hippocratic treatises on fractures, dislocations, head injuries and ulcers

are among the greatest surgical writings of all time. This surgery was, in the main, aseptic, inculcating the use of water as warm as the surgeon's hands could bear, cleansing of the operator's hands, trimming of the nails, dry wound treatment (with avoidance of greasy dressings), rest and immobilization, with a clear notion of healing by first and second intention. The directions for trephining and for setting fractures and dislocations are minute and have been followed for centuries. That the surgery of Hippocrates was mainly derived from and adapted to military conditions is indicated by his own statement in "The Physician;" "Fights between citizens and their enemies are rare, but frequent and almost daily between mercenary soldiers; he who would become a surgeon, therefore, should join an army and follow it." War was the only school for surgery at this time, for the Athenians had already established their great principle that the bearing of arms by civilians is not civilization (Thucydides). "They strove to make gentle the life of the world." With the Spartans, continuous military duty was obligatory between the ages of twenty and sixty, while in the other Greek states, young men were trained for two or three years and released from duty until the hour of need. The Spartans "lived the life of a regiment. Private homes resembled the 'married quarters' of a modern army; the unmarried men lived entirely in barracks. Military exercises were only interrupted by actual service in the field, and the whole life of a man of military age was devoted to them."³⁸ In such a "nation in arms" as Sparta there was some regular medical service, as suggested by the law of Lycurgus that the army surgeons retire to the rear of the right wing during an engagement.

According to Xenophon,³⁹ the surgeons in the Spartan army shared the same tents with the nobles, the soothsayers and the flute-players. In battle, the wounded were rescued by Helots.

The History of Herodotus (484-424 B. C.) is at once an account of his many travels and a general history of Greece, up through the glorious period when the tiny states of Athens and Sparta, relying upon courage and enterprise alone, defeated the gigantic Persian power and saved Europe for a finer civilization. Herodotus and Xenophon are our principal sources for the medical arrangements of the Persian Army, the earliest military organization of magnitude with which recorded history deals. This great army, strong in cavalry, originally made up of Persians alone, was, at the time of the expedition against Greece, augmented by a huge levy of all nationalities. The physicians of the Persian Army and fleet were mercenaries, usually Egyptians or Greeks. One of the latter, Democedes of Croton (520 B. C.), a high-salaried health

³⁸ Capt. C. F. Atkinson: *Encyclop. Britannica*, 11 ed., Cambridge, 1910, ii, 593.

³⁹ Xenophon: *Lacedaemon. Respubl.* iii, 7. Cited by Withington.

officer, being retained at the court of Darius as a captive, actually led an advance guard of Persian spies into Greece in order to get back to his home town (Herodotus, iii, 131-137). Herodotus, a teller of tales, has little to say of organization, but he has many interesting anecdotes, e. g., of the mortality in the Persian army from gluttony and change of water-supply (viii, 117), of their sufferings from epidemic diseases, of a traumatic hæmoptysis following a fall from a horse (viii, 88), of various wounds, of the treatment of wounds with dressings of myrrh and flaxen bandages (vii, 181), and of the deaths of Cambyses and Miltiades from traumatic septicæmia or gangrene (iii, 64-66; vi, 134-136).

Xenophon (444-357), a pupil of Socrates (who had saved his life at the battle of Delium), was one of the generals commissioned by the younger Cyrus to raise an army of 10,000 Greek mercenaries ("a marching city state") for his expedition against Artaxerxes. After the defeat and death of Cyrus at Cunaxa (401), Xenophon conducted the retreat of the Ten Thousand Greeks from Babylonia back to their own country. The *Anabasis* is the story of this expedition and retreat (415-400 B. C.). The army consisted of heavy infantrymen (*hoplites*) with bronze shields and helmets, purple tunics, corselets of bone, armed with swords and spears, and light infantrymen (*peltastes*) armed with javelins and wooden shields. Their pay was about \$5.50 monthly, their commissariat meal, mares' milk, and wine, bought of the sutler, with occasional slaughtering and barbecues of animals, when supplies gave out, or in connection with sacrificial rites.

In the whole narrative of the retreat there is only one mention of medical service (iii, 4), although Xenophon himself was sometimes forward with medical aid and advice (v, 8):

Marching thus for the rest of the day, some on the road over the hills, others advancing abreast of them over along the mountains, they came to the villages, and eight surgeons were commandeered, for there were many wounded. Here they remained three days, both on account of the wounded and because they had found, at the same time, abundant supplies, viz., wheat-flour, wine and barley, which had been stored up for horses. These supplies had been collected for the then satrap of the country. But on the fourth day, they went down unto the plain. When, however, Tissaphernes overtook them with his command, necessity taught them to encamp at the nearest village and not to fight while marching; for there were many unfit for action, viz., the wounded, those carrying the wounded and those who bore the arms of such carriers.

In the action preceding this halt, we are told that "the Greeks of their own motion, mutilated the dead, that it might be frightful for the enemy to see" (iii, 4). To lighten the march, the arms were sometimes carried in the wagons, the wounded usually on the backs of comrades, and one bearer was publicly scourged, by order of Xenophon,

for trying to bury a wounded man to get rid of his burden (v, 8). The troops suffered much from cold and frostbite in Armenia, many freezing to death, others laboring under snow-blindness, and Xenophon was extremely solicitous that no one should sink to sleep in the snow and kept his troops in constant motion (iv, 4, 5). Arrow wounds are mentioned, experiences with poisonous honey and headache from date-wine, and it is of record that potable water was boiled by the Persians for Cyrus in silver kettles (Herodotus, I, 188).

Upon returning to Athens, Xenophon found that Socrates had been put to death and his own knightly order in disrepute in the city, whereupon, with the remainder of the Ten Thousand, he joined the forces of Agesilaus, king of Sparta, and after the fashion of disaffected Hellenes, actually fought against his own native city at Coronea (394 B. C.). During the rest of his exile he wrote the *Cyropaedia*, or life of Cyrus, a purposeful glorification of the Persian Empire and army, in aid of his dream of a Confederated Hellas, a project for which Herodotus wrote his history, Isocrates his orations, and Aristotle his Politics. The liberal constitution and government ascribed to an Oriental despotism by Xenophon are purely mythical, and borrowed from the institutions of the Greek city states. In the *Cyropaedia* (i, v, 15-19), Cyrus says to Cambyses, his father, that even as states that wished to be healthy elected a board of health, so he took with him men eminent in the medical profession, as did other generals. In the discussion that follows, one senses the genial superiority of the workings of the Greek mind:

"Yes, my son," said his father in reply to this, "but just as there are menders of torn garments, so also these physicians whom you mention heal us when we fall sick. But your responsibility for health will be a larger one than that; you must see to it that your army does not get sick at all."

"And pray what course shall I take, father," said he, "that I may be able to accomplish that?"

"In the first place, if you are going to stay for some time in the same neighborhood, you must not neglect to find a sanitary location for your camp; and with proper attention you cannot fail in this. For people are continually talking about unhealthful localities and localities that are healthful; and you may find clear witnesses to either in the physique and complexion of the inhabitants; and in the second place, it is not enough to have regard to the localities only, but tell me what means you adopt to keep well yourself."

"In the first place, by Zeus," said Cyrus, "I try never to eat too much, for that is oppressive; and in the second place, I work off by exercise what I have eaten, for by so doing health seems more likely to endure and strength to accrue."

"That, then, my son," said he, "is the way in which you must take care of the rest also."

"Yes, father," said he; "but will the soldiers find leisure for taking physical exercise?"

"Nay, by Zeus," said his father, "they not only can, but they actually must. For if an army is to do its duty, it is absolutely necessary that it never cease to

contrive both evil for the enemy and good for itself. What a burden it is to support even one idle man! It is more burdensome still to support a whole household in idleness; but the worst burden of all is to support an army in idleness. For not only are the mouths in an army very numerous but the supplies they start with are exceedingly limited, and they use up most extravagantly whatever they get, so that an army must never be left idle."

"Methinks, you mean, father," said he, "that just as a lazy farmer is of no account, so also a lazy general is of no account at all."

"But at any rate, as regards the energetic general," said his father, "I can vouch for it that, unless some god do cross him, he will keep his soldiers abundantly supplied with provisions and at the same time in the best physical condition."

In the same work (iii, ii, 12), we are told how Cyrus detailed physicians to treat wounded prisoners:

At this juncture they brought to Cyrus the prisoners in chains and also some that had been wounded. And when he saw them he at once ordered that the fetters be taken off, and he sent for surgeons and bade them attend to the wounded men. And then he told the Chaldeans that he had come with no wish to destroy them and with no desire to make war, but because he wished to make peace between the Armenians and the Chaldeans.

The army of Philip of Macedon, with its famous phalanx, had physicians, one of whom, Critobulus, extracted an arrow from Philip's eye at the siege of Methone. On the expedition of Alexander the Great (336-323 B. C.), physicians were again present, notably Philip, Critobulus and Glaucus. Philip, Alexander's body physician, who was once accused of trying to poison him, cut out an arrow from his shoulder at the siege of Gaza. Glaucus was crucified for failing to heal Haephaestion. There is plenty of evidence of the presence of physicians at battles in Greek history. An inscription of 450 B. C. at Dali in Cyprus records a decree of the Demos that the physician Onasilos and his pupils be rewarded for attending the wounded in the Idalian expedition against the Persians. That the physician Ctesias healed the wound of Artaxerxes at Cunaxa is recorded in the *Anabasis* (i, 8). Epaminondas, creator of the Theban phalanx and of the swift oblique movements adopted by Frederick the Great, was mortally wounded at Mantinea (362 B. C.), his death resulting from the withdrawal of a spear from the wound by his physician. Finally, at the defeat of the Spartans at Sellasia (222 B. C.), the Greek's last stand for freedom, every house opened its doors and all Lacedaemonians united in refreshing the soldiers and in binding up their wounds, a trait more characteristic of republican Rome than of Greece.⁴⁰

Much was done for the health and stamina of soldiery by the splendid system of physical training and cult-cleanliness of the Greeks, their gymnastics and bathing habits, which have become the ideal of our own

⁴⁰ E. T. Withington: *Medical History* London, 1894, 74.

time, both in military and civil hygiene. A Greek vase in the Louvre shows a youth preparing to wash his feet, with the inscription *ἐρχεται*, "he makes himself ready for marching."⁴¹ That shower baths of recent type were common is also evident from these antique vases.⁴²

Of the total achievement of the Greeks in personal and public hygiene, in the light of recent researches, of what they did for physical training and military morale, Sudhoff has written with force and precision:⁴³

Viewed in the light of hygiene alone, classical antiquity, Greece and Rome, represent a cultural pinnacle of almost incomparable height.

The Greeks, a master people (with a substratum of slaves), for the first time in history, and in a scope and degree never again approached, undertook universal training of boys (in some phratries, of girls, also), with a view to the harmonious development of all the physical faculties and to the attainment of the greatest measure of strength, dexterity and self-confidence, of physical perfection and beauty. The system was founded upon daily exercise from earliest youth to ripe manhood, under the supervision of experienced and practised leaders, who not only strove to make it viable and successful, but were capable of intelligent specialization, exacting from each physical entity the highest possible accomplishment, with constant reference to general vigor. The teacher of gymnastics became the professional "gymnast," who strove to comprehend the normal functions of the body, vying with the medical fraternity, who again studied the value of gymnastics for a healthy physique and took from its storehouse of anatomic-physiologic knowledge the plumb line for estimating the possibilities of each individual. With the aid of general dietetics, the physicians deduced the norms for the application of gymnastics to the prevention of bodily ills and as an auxiliary in the treatment of general or organic disorders. Under this beneficent rivalry between professional gymnast and physician, gymnastics itself became a scientific system of physical exercise and invigoration, of hygiene of movement and occupation, such as we today, with the aid of modern technique and instrumental precision, are intent upon creating anew.

With this central endeavor of Hellenism (physical invigoration by daily gymnastic exercise), the rest of personal hygiene was in great measure associated, viz., care of the skin by washing and bathing, by swimming and massage; physical cleanliness, including care of the hair and clothing; as well as regulation of diet, rest and sleep, and of the sexual life. The regulation of the latter function in the gymnastic exercises of girls was divorced from prudery and had a definite eugenic aim: vigorous offspring.

The public officers of Greece were engrossed with other questions of hygienic importance. Town planning, arrangement of streets, sunning of houses, sewage disposal and water supply were carefully considered and purposefully regulated, especially in the culminating cultural period of the Age of Tyrants. The Romans, among whom solicitude for the purity of grain and potable water was recognized almost as a religious and state duty, with their eminent talent for solving great problems, contributed much to public hygiene. In the days of their world empire, water supply, drainage, road-building, town-planning, food-control, heating, and baths were regulated with a thoroughness which evokes our respectful admiration

⁴¹ Sudhoff: *Aus dem antiken Badewesen*. Berl., 1910, 17-18.

⁴² Sudhoff: *op. cit.*, 59-62 (illustrations).

⁴³ Sudhoff: *Ann. Med. History*, N. Y., 1917-18, i, 112-113.

even today. In the cult of Vesta and Juturna, the Roman early evinced an inherent sense of the fundamental necessity for purity of food, which can proudly take its place beside the justly extolled cult of food-hygiene of the Orient. . . . For Graeco-Roman antiquity, we must again repeat that, although hygienic requirements were partly based on cult-hygiene, these peoples soon outgrew this purposeless infancy and set themselves conscious hygienic goals, devoted themselves to their attainment in a large genial manner, and accomplished results which, in addition to constituting a scientific supervision of the life of the individual, will forever merit admiration as the first attempt (conceived and executed with genius) at personal and public hygiene with definite aims: indirect prophylaxis by increasing the vigor and resistance of two whole nations.

(To be continued)



BILATERAL PNEUMOTHORAX IN A CASE OF PULMONARY TUBERCULOSIS

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(With two illustrations)

PRIVATE 1st Class, A. J. J., Med. Dept., aged 28, on duty at the hospital, having had one year and four months service, was admitted to hospital November 3, 1919, complaining of chills, headache, pain in shoulders, arms and legs, sore throat, cough, weakness, and exhaustion which had bothered him for three days. He walked into the ward, but his gait was unsteady, and he was drowsy from loss of sleep.

Family history: Father died at 48 from accident, mother at 49 from tumor of stomach. He had one brother and three sisters who were alive and well.

Personal history: Before enlistment he had been a metal miner in Colorado, where he was born. He had had measles and mumps, but denied other diseases. Previous to his admission he had always been able to do his work.

Present condition: The patient was a rather short young man, pale and tired looking. There was a great deal of cough with a small amount of bloody sputum. There was a slight fever. Appetite was fair. The pulse was rapid (118), and respiration 32.

Examination showed limited expansion on the left side of chest, with slightly diminished tactile fremitus. The percussion note was practically normal with slight hyperresonance on the left, third rib up. Auscultation showed bronchial breathing in the left axilla and absent breathing left, third rib up. The heart apex was found to the right of the sternum.

On November 17 the respiration rate was high (40), and there was severe pain in the right back. Many fine râles were heard in the left axilla, back and front. There was slight fever and some sweating.

X-ray examination showed marked density involving the right lung, and also a density and mottling of the left lung with a pneumothorax at the apex of the left.

A diagnosis of spontaneous pneumothorax was made and, later, of chronic pulmonary tuberculosis, involving both lungs.

Progress: On December 16 it was noted by X-ray that the left pneumothorax had partially absorbed. On February 12, 1920, X-ray showed the diaphragm drawn up on both sides with a second pneumothorax at the right apex.

The Wassermann reaction was negative.

The sputum was repeatedly examined and found negative for tubercle bacilli.

The urine was negative except for a trace of albumin shortly before death.

Examination on April 8, 1920, showed marked emaciation and asthenia. The color was good, but the finger nails were blue. There was a depression above the right clavicle, and markedly deficient expansion on the left. The lower interspaces in the back retracted during inspiration.

There was hyperresonance on the right above the third rib; impaired resonance below; impaired resonance entire left front. The back percussion was similar.

Auscultation showed broncho-vesicular right front and lower axilla up to third rib; bronchial breathing second and third ribs and upper axilla; diminished vesicular above second rib. Diminished vesicular on left. Back, left—bronchial breathing eighth dorsal spine up. Right—bronchial breathing up to eighth dorsal spine; broncho-vesicular above except diminished vesicular over apex.

There were crepitant râles right front up to second rib, sibilant and crepitant, left front up to second rib. Back, right—crepitant and subcrepitant up to second dorsal spine; left—crepitant and subcrepitant eighth dorsal spine up.

There was increased tactile and vocal fremitus over the areas of consolidation. The coin test was negative. Over the areas of bronchial breathing, vocal fremitus was accompanied by considerable hollow echo.

The heart apex was in the 4th I. C. S. at the nipple. Heart sounds were negative.

The diagnosis at this time was tuberculosis, pulmonary chronic, active, right upper and lower; left upper and lower. Double partial pneumothorax at the apices.

The patient ran an irregular intermittent temperature from 98 to 102.5, generally about 99-100. The pulse varied from 90 to 120 and the respirations from 20 to 40. There was dyspnea most of the time, and a great deal of pain in the chest with anxiety and constant irritating cough which produced a thin, frothy and bloody sputum. There was profuse perspiration. Sedatives were freely given with little effect. A short time before death, respirations went up to 50 and pulse to 150. The temperature at the end was only slightly elevated. Death occurred on April 22, 1920, from exhaustion.

Autopsy: Musculature normal, deep pink in color. On opening

thoracic cavity there is found a slight double pneumothorax, both lungs being displaced slightly downward; this is more marked on the right side. The heart is displaced to the right about 1 inch and downward about $1\frac{1}{2}$ inches.

Left lung: The pleura is very thick and fibrous, presenting more the appearance of a dense fibrous coat rather than normal pleura. It is tightly adherent throughout with the exception of a small area over the apex, tightly adherent to the diaphragm below and to the pericardium internally to such an extent that parts of both of these structures were removed while taking the lung from its cavity. The lung is slightly increased in size, boggy, non-crepitant and extremely heavy; weight, 1,295 grams. On section the entire structure appears fibrinous and presents a smooth, gray appearance, "gray induration." There are no macroscopic tubercles or cavities. There is apparently a very small amount of air and a grayish, foamy liquid can be expelled from the air cells. The entire structure presents a homogeneous tissue which has a peculiar translucency of new-formed connective tissue. The general appearance is that of an unresolved pneumonia with diffuse interstitial fibrous changes. There is no anthracosis, and apparently the grayish color of the structure is not due to pigment deposit.

Right lung: Apex free; otherwise the pleura is adherent throughout. There is a small collection of slightly turbid fluid between the inferior border of the pleura and the diaphragm. On removal the lung is found to be slightly increased in size, extremely heavy, and the thickened pleura presents a glistening white appearance over the anterior surface. Weight, 1,200 grams. This lung is non-crepitant, with the exception of a very small portion in the middle lobe. The gross external appearance is that of the left lung, and it was not incised but preserved as a gross specimen.

Heart: Pericardium thickened and adherent to the pleura in its entirety. There is a normal amount of pericardial fluid. Heart is enlarged, collapsed. No apparent abnormality of valves or walls. Coronary vessels patent. There is no sclerosis of the great vessels. Weight, 382 grams.

No abnormality of the mediastinal glands, thyroid or thymus.

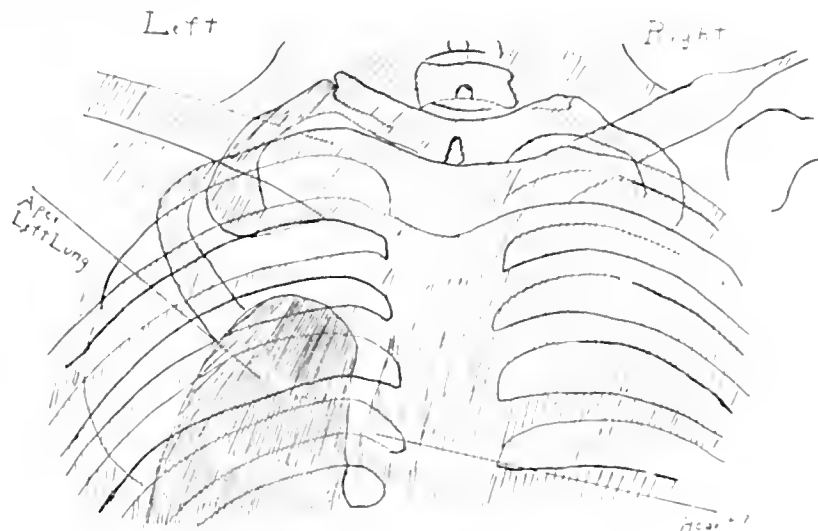
Liver: Normal in size; weight, 1,582 grams. No abnormality of structure noted. Gall bladder distended with normal appearing bile. No stones. Duct patent.

Spleen: Marked enlargement. Weight, 480 grams. There is a marked passive congestion throughout.

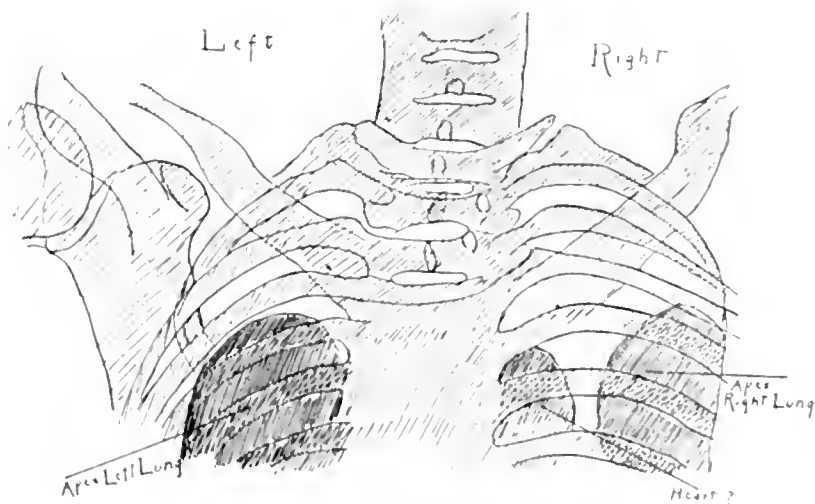
Left kidney: Slightly smaller than normal, deep red in color. Capsule tightly adherent. On incision the entire structure presents an

extremely reddened appearance and liquid blood escapes. The macroscopic picture is that of a diffuse toxic nephritis.

Right kidney: Marked increase in perinephric fat. Normal size. Capsule adherent. On incision there is the same general appearance as that of the left.



Tracing of X-Ray to Show Left Pneumothorax



Tracing of X-Ray to Show Bilateral Pneumothorax

Autopsy otherwise negative.

Culture from heart blood showed a pure culture of non-hemolytic

streptococci after forty-eight hours' incubation. Culture from left lung on blood agar showed sterile plates.

Microscopical examination—Left lung: The pleura is thickened to several times its normal thickness. More or less recent tubercles are present just beneath the pleura. Tubercles are present generally throughout the tissues examined; most of the tubercles have reached the stage of caseation, completely obliterating the anatomical structures normally present in the lung. Some tubercles are more recent and present the usual text-book picture. In some quite large sections examined, no functioning alveoli at all were found; in other sections alveoli with thickened walls, with desquamated epithelium and with some exudate were present.

There are collections of coal dust in these sections as found in most lungs; these collections are discrete areas and are no more numerous than normal in adults. There is also a somewhat general distribution of a foreign material resembling dust other than coal dust (deceased was a metal worker). This material is not found in collections but very thinly scattered about and appears to bear no relation whatever to the pathology noted above.

Stained tissue showed tubercle bacilli.

Right lung: Did not differ from left.

Liver: Tubercles were found; there is passive hyperemia, a slight necrosis of liver cells and quite marked fatty degeneration.

Kidneys: Marked passive hyperemia; rarely a few blood cells were found in Bowman's capsule and in the convoluted tubules of the cortex.

Spleen: Marked passive hyperemia.

Pathological diagnosis: Chronic caseous tuberculosis of both lungs. slight glomerulonephritis; tuberculosis of the liver, slight; bilateral partial pneumothorax.

Comment: Bilateral pneumothorax is undoubtedly extremely rare. We have not searched the literature, but find only occasional references to the condition in the standard text-books. Sergent and Courcoux (1) refer to the condition under general pneumothorax. They mention Roubier in the citation of fourteen authentic cases. We do not know whether any of these were partial pneumothoraces. Fishberg (2) mentions three cases of double pneumothorax. Landis (3) found partial pneumothoraces to be generally in the lower chest and rare in the upper. This case, then, should be of general interest. The pneumothoraces in this case were not complete but still were fairly large, as shown by the radiograph. They were not confined to the apices but extended well down the chest cavities, and there was marked

dyspnea and heart displacement. The patient lived more than two months after the second pneumothorax was found.

It was remarkable that the patient lived so long with such extensively diseased lungs and such marked dyspnea and exhaustion. The lungs were entirely non-crepitant, with the exception of a small portion of the middle lobe, right lung. The progress of the case showed that a pneumothorax first appeared on the left side, pushing the heart over to the right. Later, this partially disappeared, the heart coming back toward the left. Then a right pneumothorax was found. X-ray proved that a double pneumothorax was present.

It appears to us that the extensive adhesion of the lungs to the diaphragm and the chest wall and the solid condition of the lungs were factors in the causation of the pneumothoraces. The intense dyspnea and the effort of the patient to secure sufficient air for respiratory need probably aided in the causation of the second pneumothorax, at least.

The locations of the openings into the pleural cavities were not found.

It seems unusual to fail to find the tubercle bacillus in tuberculosis of this type.

The lungs were so solid that slices resembled slices of eggplant, and the right lung was sent to the Army Medical Museum to be preserved as a specimen showing how much of a lung may be involved and yet the sputum not show the bacillus.

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REPORTS AND RECORDS OF COMMUNICABLE DISEASE¹

By HAVEN EMERSON, A.M., M.D., OF NEW YORK

Scope.—Epidemiology may be described as the science or study of the incidence, cause of origin and spread of such diseases as occur chiefly or generally in groups of cases and come within the commonly accepted definition of communicable and preventable. An office of epidemiology is therefore primarily concerned in obtaining and collecting for study data as to (a) the population under consideration, (b) environment, i.e., the conditions of sanitation in the broadest sense; the physical surroundings, to include food, water, air, climate, housing, etc.; the physical, to include occupation, recreation, education and discipline; and (c) the incidence of the diseases as they occur.

Sources of Information.—Population—i.e., strength figures, were obtained weekly from The Adjutant General's Office and from the General Staff (personnel division), and included troops in Russia and Italy, and only such troops after they had landed in Europe, not while on transports to the A. E. F.

The monthly sanitary reports (form 50, M. D.) from all commands, special sanitary reports upon sanitary conditions existing during particular emergencies regardless of the presence of disease, and reports of special inspectors and investigators, assigned usually from the central or base laboratories, to make field study of conditions with the object of giving expert technical advice and service to medical officers of commands where disease was epidemic or threatened to be so, were the three sources of information which reached the Office of Epidemiology.

Of the preventable causes of hospitalization or noneffectiveness, injuries and accidents, occurring otherwise than in action, supplied a considerable proportion of wastage of life and loss of time in the A. E. F., but this large group was not, until the winter and spring of 1919, subjected to special study and analysis, and then only in the office of the Surgeon of the Third Army. Of the preventable communicable diseases, tuberculosis, venereal diseases and the influenza and pneumonia groups will be dealt with in other chapters. There remain for consideration the following communicable diseases which occurred in the A. E. F.: Anthrax, chickenpox, diphtheria, dysentery, german measles, infectious jaundice (spirochetel), influenza, leprosy, measles, meningitis (meningococcus), mumps, paratyphoid fever, poliomyelitis, scarlet fever, smallpox, trench fever, typhoid fever, typhus fever.

¹Prepared for the Medical History of the War and published by permission of the Surgeon General of the Army.

Reports of Disease.—Reports of these diseases, as of all other causes of sickness, were, prior to March 11, 1918, received only by mail communications, in compliance with pars. 201, 202 and 203, Manual for the Medical Department, par. 76, and on forms 22 and 52 (M. D.). These reports were commonly incomplete as to numbers of cases, identity of patients, place of origin and organizations exposed, while the delay in transmission was usually such that further action by the Office of the Chief Surgeon was unprofitable, and further report, as called for by the French, futile except as a matter of formal record.

On March 11, 1918, Circular 13, C. S. O., was issued, and, with the slight additions incorporated in Section XII, Manual of Sick and Wounded Reports, in effect June 15, 1918, the reports of the specified communicable diseases upon which all subsequent studies were made, were in compliance with the circular and section quoted:

XII. REPORT OF EPIDEMIC DISEASES

1. Special telegraphic or telephonic reports will be required once each twenty-four hours (ending midnight) of commanding officers of field hospitals, evacuation hospitals, camp hospitals and base hospitals, of all cases or suspected cases of the following diseases occurring in their command or admitted to, or occurring in, their hospitals, that have not been previously diagnosed in full and reported. At the time the case of any of these diseases is diagnosed and reported this fact will be stated by entering on field medical card or diagnosis tag, in space for diagnosis, "Notifiable disease reported," or abbreviated "N. D. R.," for the information of the commanding officer of each hospital to which the patient may be admitted and to prevent duplication of records: chickenpox, cholera (Asiatic), diphtheria, dysentery, German measles, measles, meningitis (meningococcus), paratyphoid fever, plague, scarlet fever, smallpox, typhoid fever, typhus fever.

2. This report will include name, rank, organization (including company) and place of origin of infection (town or village).

XIII. WEEKLY VENEREAL REPORT

1. All surgeons of organizations and all surgeons of detachments operating independently of their main command will submit a weekly report of venereal disease by courier where possible, or by mail. No cases of venereal disease detected before debarkation of troops will be included in this report. Commanding officers of all hospitals and hospital trains will make separate reports for the personnel of the command and for new cases developing among patients.

Attending surgeons and senior medical officers of camps which serve as concentration centers for smaller units will make this report for each component organization within the jurisdiction of the reporting officer during the week.

2. This report will include the following data presented in the following form:

Name of organization:

Strength of organization on day of report:

S. O. S. Section or Special Area within which located

Week ending

Number of cases of:

Chancroid	Gonorrhea	Syphilis	Total number of venereal disease cases occurring after failure to take prophylaxis

3. The original report will be forwarded direct to the Chief Surgeon, A. E. F., S. O. S., and shall not be sent through channels. Army, corps, division or section surgeons may require duplicate copies. These duplicates will not be forwarded to the Chief Surgeon, A. E. F., S. O. S.

4. The period of the report will be construed to mean seven (7) days ending at midnight on Wednesday. It will be forwarded by the responsible medical officer as early as possible the following day.

5. Report of the strength of the command will be submitted even though no new cases have developed. This report applies to all A. E. F. troops regardless of whether they are serving with the Allies or not.

6. This report and the reports called for by G. O. No. 77, G. H. Q., A. E. F., and by MEMORANDUM FOR COMMANDING OFFICERS OF TROOPS ARRIVING ON TRANSPORTS, dated November 15, 1917, G. H. Q., A. E. F., are the only reports of venereal disease now required by the Chief Surgeon, A. E. F. No others will be submitted.

Telegraphic report of mumps was not called for, because of the impracticability of obtaining telegraph service of extent necessary for this, and of the relative uselessness of central reporting of a disease against which no measures of emergency prevention had hitherto proved effective. For similar reasons, telegraphic reports of pneumonia and influenza were not called for. It was expected that the occurrence of anthrax, infectious jaundice, leprosy and poliomyelitis would be so rare as to play no important rôle in France or England, and that, if cases did occur, they would be considered of enough importance to elicit telegraphic report regardless of circulars or other orders. Trench fever and whooping cough had not occurred, or at least the former had not been recognized, in enough instances in the A. E. F. to warrant the requirement of reporting them by telegraph. Confirmation, often with correction of data, of the telegrams by mail, was required. A subsequent check upon these reports was available by comparison with daily nominal roll of hospital admissions, transfers, changes of diagnosis and deaths, at the office of the division of Sick and Wounded. From the surgeons of the base sections telegraphic reports were received on the arrival of transports whenever cases of the specified communicable diseases had occurred during passage from the United States, giving information as to name, rank, organization, etc., of the patients and the identity of organizations exposed.

From the French there were received reports of the communicable diseases among our patients in their hospitals, and every ten days a report of these diseases among French troops in different regions in France. Each month there was also received from the laboratory officer (*l'Adjoint Technique*) of each region a summary of the communicable disease situation among the civil as well as the military population. A report of the total incidence of the communicable diseases in the French armies at the front, together with the strength of these armies, was received each ten days.

From the British a weekly report of communicable diseases was received, of our sick in their hospitals, and of the total incidence of the same diseases in the entire B. E. F., together with the strength of the forces at the time of the report.

Filing.—On the receipt of report of a case, either definitely diagnosed or suspected, of one of the diseases specified, at the Office of Epidemiology an entry was made in a daily blotter giving the administrative area from which the report came, the designation of the hospital and the commanding officer reporting the disease, the name, rank and organization of the patient, the place of origin of infection, where known, or as suspected in the case of typhoid and paratyphoid fever, the date of the onset of the case, and the date of transmission of the report.

A card file was maintained, recording disease and dates of report by organization—i.e., by companies or equivalent subdivision—of large units. Another card file was used to record cases by disease and date alphabetically according to name of town, village or other place given as place of origin of infection. In order to permit of rapid assembly of data for each disease according to area or administrative section, by days, weeks, or months, a third card file was kept which showed the daily admissions by diseases, days and hospitals reporting, assembled on a card for each of the main ten administrative areas (Base Sections 1, 2, 3, 4, 5, 6, 7, Advance and Intermediate Sections, and District of Paris). The cases as received were indicated by pins of different colors on a map of France and England according to place of origin of infection, four such maps being used in rotation for four successive weeks to give a graphic picture of local distribution and changes in incidence for a period of one month.

The method of filing the reports received as above outlined made it possible to analyse disease incidence by organizations, areas, and by individual towns or departments, to calculate rates by any desired unit of time and compare these rates with the incidence of the same diseases among our allies for comparable periods of time. These were the objects aimed at.

Venereal Disease Reports.—Until August, 1918, the weekly reports of venereal disease incidence by commands gave such incomplete records that no reliance could be placed upon the rate calculated, and the information contained was insufficient to permit of analysis of distribution of cases by organizations and location of source of infection, facts essential for any intelligent supervision and control of these diseases. After August 21, reports of venereal diseases were received in compliance with Section XIII, Manual of Sick and Wounded Reports. The analysis of the reports subsequent to this date was made by organizations and administrative areas, at first in the Office of Epidemiology, and later in the Division of Venereal Diseases, which was established at Tours in December, 1918.

Routine Reports Issued.—There was issued each week a report of all the communicable diseases listed in Sections XII and XIII, Manual of Sick and Wounded Reports, by disease and by administrative area, and this report was published on Monday morning for all diseases except the venereal diseases for the week ending Sunday the day previous, and for the venereal diseases (reported by mail) for the week ending the Wednesday eleven days previous. A list of organizations arriving at base ports within the week which had been exposed to infection during transportation from the United States was published in the Weekly Bulletin of disease. A report of the communicable diseases (Section XII, Manual of Sick and Wounded Reports) occurring in the A. E. F. was made each week to the French Service de Santé giving place of origin of infection, together with total number of cases charged against each place since the beginning of an epidemic. A separate report to the commanding general of the allied armies was made weekly, giving totals for each disease included under Sections XII and XIII, Manual of Sick and Wounded Reports, and for pneumonia and influenza. Monthly summaries of disease were published in the Weekly Bulletin. Charts of rates per 100,000 strength by weeks and months were kept, and, in periods of epidemic prevalence of certain diseases, daily graphs were prepared.

Special Reports.—Special reports were made by wire and mail to the Chief of Division of Sanitation, to the Director of Laboratories and to the Surgeons of armies, divisions, sections and other administrative areas, to Commanding Officers of hospital centers and hospitals whenever it was thought that warning of cases or information concerning their distribution, which might not have reached them so promptly through other channels, would be helpful in detecting, preventing or controlling communicable diseases in areas or among groups which the respective officers were responsible for.

Sources of Statistical Error.—The main sources of statistical error were similar to those affecting civilian health statistics, and they fall naturally under the following headings. (1) Error in diagnosis; (2) failure to report, duplicate reports, changes of diagnosis after reporting, failure of arrival of telegram or confirmation; (3) errors in computing strength returns. The requirement to report suspicious cases as such doubtless prevented all but a slight error under the first heading. Checking of primary telegraph reports against daily mail confirmation copies, constant follow-up of delinquents and checking every name reported against the daily office blotter record of name and disease resulted in small error under the second heading. Estimates of rates while troop arrivals were causing large weekly increments of strength always led to rates of incidence less than the true rates, these being based on the strength for the week of report, while the origin of the cases according to incubation periods of the different diseases was at a time one or two weeks earlier, when the strength may have been 10 per cent less. Similarly, while troops were embarking in large numbers from France and England, January to July, 1919, the weekly rates were fictitiously high. The monthly rates are considered more reliable than the weekly rates.

Application of Information.—The measure of the value of any such system of disease records, the justification for all the work imposed upon reporting officers in the hospitals, must be sought in the results of the practical application of all the sorted facts of incidence and distribution of disease to its control. No decisive answer can be given to such a question, for the true reason of increase and decrease of many of the communicable diseases, which usually show epidemic distribution, is still unknown in the majority of cases, but examples are abundant to show that, while troop movements were rapid and extensive throughout the A. E. F., the information sent out from the Chief Surgeon's office to widely separated units, to Surgeons of armies and sections, put many a medical officer of commands on his guard and permitted early and adequate segregation of exposed or already infected men from contact with units known to be free from disease. When men with undetermined fevers or undeclared rashes, who were later proved to have cerebrospinal meningitis, scarlet fever or typhoid and were left behind in a base port hospital in England while the rest of the company, regiment or division went forward from England to France, across France from base port to training area, from training area to front line in the course of ten days, only close coordination of a centripetal reporting system with widespread issue of warning from the central office to section and camp surgeons within whose jurisdiction the infected

troops were to pass successively and to the surgeon of the constantly moving troops, prevented infection of many French civilian communities, and of our own troops with whom the new arrivals might come in contact.

When during violent and sustained battle activity cases of typhoid fever, not yet diagnosed, were evacuated in the course of ten days through as many hospitals and were detected in the acute stage of the disease and so reported from Savenay, Vichy, Périgueux or Brest, the information sent back to the surgeon of the division or army from which the patient came was not infrequently the first information he had had that enteric disease was prevalent or had appeared at all among his own troops.

While twenty cases of diphtheria spread out among fifteen hospitals over three-quarters of France might not give rise to alarm, if all or most of these cases were found to have come from one regiment of a division which had had several severe outbreaks and was now supposed to be free, the information only obtainable by a central office of report and analysis sent at once to the division surgeon would save his command from an unnecessary renewal of the disease.

The smaller the area of observation the more intensive may be the profitable study of distribution of disease. The more rapidly moving the troops, the wider the area covered and the more communities they come in contact with, the more essential is it to have immediate central report of all cases of communicable diseases, at least daily (in the B. E. F. the reports were made to their central office twice each twenty-four hours), and, at the center, provision for analysis of reports and prompt action upon them.

The information received at the Office of Epidemiology from the epidemiologists of the central and base laboratories, from the sanitary inspectors of sections and armies and from the results of autopsies reviewed and reported from the Central Medical Department Laboratory at Dijon were of the greatest importance in detecting errors in reporting and obtaining early warning of mistakes in diagnosis. Also, through the Director of Laboratories at Dijon and the commanding officers of base laboratories and the surgeons of sections and armies, the most effective and appropriate action was always obtained when warning or request for special report or precautions was sent from the Office of Epidemiology of the Chief Surgeon's Office, either in individual communications or through the medium of the Weekly Bulletin or official Chief Surgeon's Office circulars.

FRANCO-AMERICAN LIAISON IN THE SERVICES OF SUPPLY MEDICAL
DEPARTMENT (Sanitation)

The liaison between the French and American Medical Department was established in the S. O. S. through the intermediary of "missions" and through the local and regional Franco-American "sections."

The French Mission at Headquarters S. O. S. included a medical officer in liaison with the Office of the Chief Surgeon. The chief surgeons of sections and of bases, and of a few of the larger hospital centers, also had a liaison officer assigned to them.

The Franco-American Sections at the large French Services were instituted by a circular letter from the Prime Minister, Minister of War, dated December 30, 1917 (No. 30677-1-11).

The Under-Secretary of State for the Service de Santé, and each regional director of the Service de Santé, thus had at their disposition a Franco-American section composed of a French medical officer able to speak English and of an American medical officer.

The duties of these sections were fixed as follows: Their exclusive mission was to study, on behalf of the authorities whom they served, all Franco-American affairs transmitted to them and to follow their solution until completion.

Ministerial circular letter No. 2456-3-7 (February 12, 1918) prescribed that the local representatives of the American Medical Department be put in touch with the technical head (*adjoint technique*) of the regional headquarters, who would bring to bear his experience in the solution of all questions of hygiene, epidemiology and prophylaxis concerning American contingents.

Ministerial circular No. 2902-3-7 (February 20, 1918) prescribed that the head of each regional headquarters offer his collaboration to the American Medical Department, and that the liaison should be carried out especially on the following points:

(a) Study and survey of water supplies.

(b) Putting all bacteriological laboratories at the disposal of American medical officers (establishment and confirmation of diagnosis in cases of communicable diseases, search for germ carriers, water analysis, etc.).

(c) Regular and constant receipt of all communications concerning the cases of contagious diseases observed among American troops, and concerning prophylactic measures taken to check their spread. Reciprocally, notification to the American authorities of all epidemics among French population, civil or otherwise, of any importance, with description of preventive measures taken.

(d) Notification to the American Medical Department of localities quarantined and released from quarantine.

(c) Study, in collaboration with the chief medical officers of centers, as well as with the chief medical officers of dermato-venereal sub-centers, of all questions concerning the American Medical Department, and bearing on the treatment and prevention of venereal disease. Putting at the disposal of the American Medical Department, as a matter of information, translations of all regulations, circular letters and notices concerning sanitation, epidemiology and preventive measures.

In order to comply with the general instructions above, the following reports were made by the regional Franco-American "Sections":

(a) Report every ten days of all contagious diseases among American troops stationed in the region, including all necessary precautions. Eventually, these reports were sent to the Sous-Secrétaire d'Etat du Service de Santé (First Technical Division).

(b) Notice to civil authorities of contagious diseases occurring among American troops, promptly made, in compliance with Notice 36 of the Regulations of the Service de Santé (Act of February 15, 1902).

(c) Monthly report by chiefs of dermato-venereal centers and sub-centers, including in a special chapter all questions concerning venereal diseases occurring among American troops.

(d) Monthly report by the assistant chief medical officer of the region or the technical adviser, was addressed to the medical officer of the French Military Mission at Headquarters S. O. S., to be transmitted to the Office of the Chief Surgeon.

In compliance with request from the Chief Surgeon, A. E. F., the Sous-Secrétaire d'Etat du Service de Santé, on April 15, 1918, called the attention of the regional directors of the Service de Santé (telegram No. 5678-3-7) to the necessity of notification of all new cases of the following diseases, occurring among American troops and hospitalized in French formations of each region; this declaration to be sent by mail by the Regional Franco-American "Section": chickenpox, cholera (Asiatic), diphtheria, dysentery, meningitis (meningococcus), paratyphoid fever, plague, scarlet fever, smallpox, typhoid fever, typhus fever.

This declaration was to include the name and organization of patient, the nature of the disease, date of admission, designation of French hospital where admitted, and place of origin of the infection.

This information was to be delivered to the American medical officer of the Franco-American sections, whose duty it was to forward it to the Chief Surgeon, A. E. F. (Division of Sanitation).

Notification of Contagious Diseases to the French Authorities.—By order of the Chief Surgeon under date of February 29, 1918, all surgeons of organizations or units were required to make declaration to the local

civil and military authorities, immediately upon diagnosis, of all cases of contagious disease occurring in their organizations.

Besides the aforementioned, the Franco-American liaison was of great benefit and importance on certain points: (a) Delivery of sera to American medical officers by French laboratories, (b) sterilization and analysis of drinking water in railroad stations.

Consequent to ministerial circular letter of October 18, 1918, the principle of collaboration of the American and French medical authorities concerning reports relative to bacteriological chemical and sanitary tests of water supplies along railroad lines traveled over by troop convoys was recognized, and the necessary steps were taken to advise laboratory officers in charge of water analysis of it.

An agreement was reached between the High Commissioner for Franco-American affairs and the Minister of Public Works consequent to a request by the American Water Supply Service, Director General of Transportation and Medical Department, and it was decided that control and analysis of water supplies in railroad stations and along railroad lines should be exercised jointly by the American and French medical officers. Likewise, posters "drinking water" in both French and English were to be placed, at the discretion of the American and French medical officers, wherever justified, in stations.

(c) Influenza epidemic—reciprocal reports. By ministerial telegram 29915 B-4-7, October 29, 1918, the Under-Secretary of State for the Service de Santé informed the regional chief medical officers that all information at their disposal concerning influenza, its spread, evolution, etc., should be communicated daily to the American Medical Department through the regional liaison officers.

Vice versa, a letter from the Chief Surgeon dated October 24, 1918, bearing on the influenza epidemic, called the attention of all members of the Medical Department to the urgent necessity of maintaining liaison and daily interchanges of information with the French medical officers, with a view to detecting the appearance of influenza cases and of studying the preventive measures necessary to check their spread. It was recommended that all medical officers, as far as possible, should obtain all available information which might prove of value to the Medical Department from the Service de Santé and should likewise communicate their views and findings in the same manner to the Service de Santé.

(d) The liaison between the Medical Department and the French medical officers proved to be most valuable in that which concerned local questions of a sanitary character relative to American troops (camp sites, dangerous territory, etc.).

MINOR COMMUNICABLE DISEASES IN THE A. E. F.

By HAVEN EMERSON, A M., M.D., OF NEW YORK

ACCORDING to Section XII of Manual for Sick and Wounded Reports which went into effect June 15, 1918, and thus continued in force Circular No. 13, issued from the Chief Surgeon's Office March 11, 1918, only certain communicable diseases were to be reported directly to the Chief Surgeon's Office by telegram or telephone on the day of diagnosis. Not infrequently, however, various other diseases which were rare, or were capable of causing much inconvenience if unchecked, were reported by telegram, and at the office of epidemiology attention was given to the occurrence of all the communicable diseases, including those of which report was made only through the medium of the daily nominal roll of the sick and wounded by mail.

Owing to the long time which generally elapsed between the development of most of these diseases and the receipt of report at the office of epidemiology there was rarely any adequate opportunity to make studies competent to verify the diagnosis or to discover the origin and path of infection of primary and secondary cases.

ANKYLOSTOMIASIS

Ankylostomiasis was given as a diagnosis in three cases in 1917, one each in August, October, and December; in thirty-seven cases in 1918, one each in February and June; the others as follows: July, two; August, seven; September, sixteen; October, four; November, two; December, six; and eight cases in 1919, of which six were reported in January and two in February. These cases were discovered in examination of stools in cases of severe anemia, in cases of acute or chronic intestinal inflammation of undetermined origin in which the ankylostoma or eggs were found incidentally, and in the course of routine laboratory examination of stools in hospitals. The cases were found among soldiers whose homes had been in the hook-worm belt in the United States, and there was no good reason to believe that any cases developed as the result of exposure or contact with carriers among fellow-soldiers in France, although there were in many places such neglect of latrine and mess sanitation that the occurrence of direct hand-to-mouth infections need not have caused surprise. One death from ankylostomiasis was reported in October, 1918, but, failing autopsy confirmation, this can hardly be accepted as conclusive.

ANTHRAX

Although the published experience of the British Army and of the Local Government Board of England with anthrax in 1915 and 1916, caused by the use of shaving brushes made from an inferior grade of

bristles imported from Siberia, Manchuria and Argentina, might well have put the American Medical Service on its guard, surprise at the appearance of a number of cases in the United States and in the A. E. F. was not unnatural.

No cases were reported in the A. E. F. until March, 1918, after which there were sixty-five cases reported in the next twelve months as follows: March, two cases, one death; April, five cases, two deaths; May, eight cases, four deaths; June, eight cases, two deaths; July, thirteen cases, no deaths; August, seven cases, no deaths; September, eleven cases, one death; October, seven cases, no deaths; November, three cases, no deaths; December, January, February, three cases each and no deaths; March, four cases; April, one case and no deaths.

With rare exceptions the initial lesion was on the shaving area of the face and a new shaving brush had recently been used. In a number of instances the brushes were examined and the *Bacillus anthracis* was found. Although it is possible that the organisms on the brush may have come from the face lesion of the already infected patient, enough instances of discovery of the organism in new unused brushes were met with in the United States and in the A. E. F. at Liverpool and Dijon to make the case quite clear as to the origin of the infection. The fulminating cases with hemic and meningeal involvement were diagnosed as septicemia and meningitis; one case was treated for several days and until just prior to death as mumps, and several were unrecognized until just before death, when a diagnosis of cellulitis of the neck was changed to that of anthrax. Some cases originally diagnosed as anthrax were found to be cases of streptococcus abscess and meningitis.

The total absence of anthrax among animals in the places in England and France where our troops were billeted lent little support to the common belief of the men and of their medical as well as line officers that the infection came from the stables often used for billets, or from horse blankets, which were occasionally needed and used for bed coverings.

The fact that the great majority of the cases of anthrax were discovered soon after the arrival of troops at base ports in England and France gave rise to the suspicion that troop decks and holds adapted in cattle ships for troop transport purposes might have been the place of origin of infection from infected cattle or hides. Information sent to the office of the Surgeon General at Washington coincides with observations made in the United States, and orders were issued which adequately protected the men against the distribution or purchase through the Quartermaster Department of shaving brushes which had not been so treated as to destroy any anthrax bacilli or spores.

Several makers of low-grade shaving brushes were found to have made use of bristles from known infected foreign areas and to have used insufficient precautions during manufacture to obtain complete sterilization of the bristles.

FAVUS

Seven cases of favus were reported, one each in the months of October and December, 1918, and February, 1919, and two each in November, 1918, and January, 1919. No information was obtained as to whether these were cases with origin prior to enlistment and undetected at that time or, if developed since enlistment, whether a possible or probable source of infection were found in any case from among French civilians in the billeting areas.

GLANDERIS

Ninety-eight cases of glanders were reported between June, 1918, and March, 1919, with one death in October, 1918. It may well be doubted whether any but the one fatal case were cases of glanders, bearing in mind the facts as stated by Osler: "The outlook is bad in every form of glanders. Acute and chronic glanders and acute farcy are practically always fatal. Chronic farcy sometimes ends in recovery."

In spite of the fact that glanders among the draft animals in the A. E. F. was very prevalent and attained extensive epidemic proportions so that there were many opportunities for infection of the personnel handling horses and mules, it is presumed that change of diagnosis from glanders was made in most of the cases and that there was the common failure of reporting the correct or final diagnosis.

LEPROSY

Leprosy was reported first in a case of the anesthetic facial type in a man in July, 1918, and the diagnosis in this case was definitely determined. In September and October, 1918, five cases each were reported; in November, one case; in December, four cases; in January, 1919, one case with a death; and in February, two cases. These cases were not confirmed, and together with the death attributed to this disease it is most likely that these cases must be put down as unproved. The fact that the disease does not develop into a communicable stage in this climate made its occurrence a matter of curiosity and a subject of clinical interest rather than one of sanitary importance.

POLIOMYELITIS

Fourteen cases of poliomyelitis were reported, one each in the months of May, July and September, 1918; two each in June, August and October, 1918, and February, 1919; and three in January, 1919. Two

deaths were due to poliomyelitis as proved by autopsy, one in May, 1918, and one in September, 1918.

The diagnosis was considered very doubtful in a number of the cases in which the paralysis was of but brief duration and confined to small muscle groups. In others the disease was severe enough to be mistaken for acute epidemic meningitis. No two cases occurred in such relation to each other or in sufficiently definite relation to cases in the civilian population to justify any conclusions as to probable contact origin of infection.

It was suspected by the consultants in neurology that some of these cases were really cases of lethargic encephalitis, which appeared in small epidemics among the French and British in civil and military populations in 1917 and 1918.

No cases of this latter interesting and still somewhat obscure clinical entity were officially reported as such.

RABIES

One case with death from rabies was reported in May, 1918, two cases were reported in June and one case each in August, October and December, 1918, and one in January, 1919, with no deaths. Positive proof of the existence of rabies in the attacking animal was lacking in several of these six cases, notably in one case where the injury was said to have been made by a cow. The cow did not develop rabies. Rabies, although always endemic in France, was reported as particularly prevalent in Paris in the spring of 1918, and widely throughout France in the spring of 1919, whence it was taken to England by surreptitious introduction of dogs past the quarantine restrictions by returning troops, and in one notable instance by an aviator.

RUBELLA

Rubella or so called German or "Liberty measles" was reported in forty-six cases between July, 1918, and February, 1919. The reporting of this disease by telegram was called for, although even as a differential diagnosis in suspected measles and scarlet fever it is of hardly more than academic interest when it appears among troops.

SPIROCHETAL JAUNDICE

(Ictero-hemorrhagic or infectious jaundice)

The first case of spirochetal jaundice was reported in April, 1918, the source of infection not being discovered. Seventy-nine more cases were reported as follows:

1918: June, 5; July, 6; August, 8; September, 20; October, 19; November, 10; December, 8.

1919: January, 10; February, 1.

Five deaths were reported; one each in the months of June, August, September, October and December, 1918.

In a small fraction of the cases only was there obtained adequate laboratory confirmation of the diagnosis and in no instance was the presumed infecting organism found in rats collected where the infection was supposed to have originated. That there was considerable laxity in use of terms for diagnosis of acute febrile diseases accompanied by jaundice can be understood from the fact that yellow fever was given as cause of death of a member of the A. E. F. in October, 1918 and ten cases of yellow fever were reported between June 15, 1918, and February 28, 1919, all of which cases it may fairly be said were something other than yellow fever.

Infectious jaundice occurred in small epidemics at various times and places in the armies of our British, French and Italian allies and exposure to infectious discharges of men and rats doubtless offered opportunity for infection among our troops.

TETANUS

Twenty-six cases of tetanus were reported with nine deaths, distributed as follows:

	<i>Cases</i>	<i>Deaths</i>
1918		
July.....	1	1
August....	3	1
September.....	4	1
October.....	7	3
November.....	0	1
December.....	6	1
1919		
January.....	0	1
February....	2	0

In almost all cases of tetanus it was shown that preventive inoculation with tetanus antitoxin had not been given at all or had been given at a time so long after the injury that protection could not reasonably have been expected.

In almost all cases where it was shown that protective inoculation had not been given, or if at all had been given too late, the explanation was to be found in the emergencies of service and of supplies which were inevitable under the conditions of active combat and evacuation of wounded prevailing at the time.

TRACHOMA

One hundred and thirty-nine cases of trachoma were reported, distributed as follows:

1917: December, 2.

1918: January, 5; February, 0; March, 2; April, 0; May, 0; June, 3; July, 13; August, 19; September, 20; October, 19; November, 17; December, 12.

1919: January, 11; February, 16.

Inasmuch as practically every case of trachoma was seen, the diagnosis established or corrected and the treatment directed by the chief consultant in ophthalmology or by one of his assistants, there is good reason to believe the reports of these cases are accurate. Although there was a great deal of trachoma among the Chinese labor troops employed by our British and French allies and by ourselves, there is good reason to believe that the great majority of the cases of this disease reported in the A. E. F. had originated prior to entry into army service and were not acquired in France or England. The conditions of neglected personal hygiene and of exposure to dust and dirt were in all probability responsible in large measure for such recrudescence as occurred in cases supposed to be cured, and accepted at the time of enlistment as free from disease.

TRENCH FOOT

Although trench foot is now generally accepted as a preventable form of damage to the skin, underlying soft parts and the blood vessels of the feet and legs owing to prolonged exposure to cold and wet, and circulatory stasis from prolonged standing, the affection occurred under such conditions as to bring it under study as an infection. In fact various microorganisms, bacterial, spirochetal and mycotic were said by various authors to be the true cause of the condition. When once the responsibility for preventing this serious disability, which often resulted in crippling for life, was placed upon the regimental and battalion line officers the incidence of the disease, even among the British in trench positions where it was most difficult to avoid, fell to a very low figure.

The disease never played any important rôle in noneffectiveness in the A. E. F. chiefly because our participation in the holding of trench lines was only to an insignificant extent during the months of the year when the cold and wet were of such severity and continuousness as to develop cases in any numbers. The largest number of cases occurred during the Argonne-Meuse offensive in October and November, 1918, when it was impossible to get relief, dry clothing, sound shoes, shelter or warmth to men who were fighting continuously day after day and for several weeks, exhausted, chilled and wet. Among the cases reported as trench feet the great majority consisted of minor grades of inflammation and frost bite, ulcerations and erosions of water-logged skin, and

not the serious deep gangrene and sloughing which marked many of the cases among the British in the early years of the war.

The 1,832 cases were distributed as follows:

1917: October, 20; November, 95; December, 28.

1918: January, 35; February, 8; March, 18; April, 5; May, 6; June, 7; July, 22; August, 15; September, 82; October, 529; November, 599; December, 152.

1919: January, 165; February, 56.

Five deaths were attributed to trench foot: two each in October and November, and one in December, 1918.

TRICHINIASIS

Thirteen cases of trichiniasis were reported with no deaths, one case in September, 1917; one in July, 1918; eight cases in December, 1918; and three in January, 1919. The prevalence of domestic and farmyard slaughtering of hogs, and thus the frequent escape from any official examination of pork and pork products for presence of infection with the trichina leaves many opportunities in France for infection. However, the universal French custom of thorough cooking of pork products is a great protection against the disease.

In connection with the above statement of incidence of trichiniasis it may be interesting to note that there were reported 107 hospital patients in the A. E. F. in whom various intestinal parasites, other than ankylostoma or the amebae or bacilli of dysentery, were found. These cases were distributed as follows:

1918: June, 5; July, 6; August, 15; September, 13; October, 15; November, 11; December, 12.

1919: January, 21; February, 9.

TYPHUS EXANTHEMATICUS

Typhus fever was reported once in October, 1917, twice in August, 1918, and once in December, 1918. The best opinion available in the A. E. F. and from the French was to the effect that the case reported in October, 1918, was a case of true typhus, although the source of infection or opportunity for exposure was never discovered. There was much room for doubt in the diagnosis of each of these cases, and equally competent observers held different opinions as to the diagnosis. No one of these four was considered to be a typical case. No one was traced even to a probable source, and no secondary cases are known to have arisen from these cases. Eleven cases were reported in February, but it is supposed that these were reported as suspects at a time when cases were being discovered among repatriated French and German prisoners in Alsace and Lorraine, and the corrected diagnosis was never

reported. Certainly the Office of the Chief Surgeon was never notified of any such occurrence, and no special investigation of such a group of cases was made. It is presumed the original diagnosis of these eleven cases as reported in the daily nominal roll of sick and wounded was an error.

VINCENT'S ANGINA

There is so much looseness in the use of this term that it is more than doubtful if any reliance can be placed upon the reported incidence of the disease in the A. E. F. Vincent's angina when properly used applies to lesions, membranous or ulcerative and destructive, caused by the specific spirochete of Vincent upon tonsils and in the pharynx, giving rise to angina, similar to that caused by diphtheria.

The same organism is very constantly found along the gum margins in ulcerative gingivitis and in stomatitis associated with or resulting from bad oral hygiene. The members of the dental corps almost universally, and medical officers in the A. E. F. very commonly used the term Vincent's angina to describe the lesions of stomatitis or gingivitis from which the Vincent's spirochete was recovered, even when, as was true in the overwhelming majority of cases, the lesions did not involve tonsils or pharynx or any part of the upper respiratory or alimentary tract other than the gums and buccal surfaces. Vincent's stomatitis would be a less inaccurate term than Vincent's angina if applied to most of the cases reported by the latter term in the A. E. F. Careful bacteriological examinations were made of the lesions in several considerable groups of cases, and Vincent's organism were commonly found. It was shown that excessive use of tobacco and persistent neglect of daily brushing of teeth were responsible for the contributing bad oral hygiene. A low state of nutrition and general debility due to fatigue, exposure, and improper variety and character of food were found also to be important contributing factors. The spread of the disease among groups of men was obviously due to lack of proper sanitation of messes or boiling of mess kits after use. Common use of pipes, drinking cups, eating utensils, towels, etc., was in all probability the direct means of transmission of the infection, as well as the common soiling of hands by salivary discharges on door knobs and objects handled in common. Sixteen cases were reported in 1917, 590 in 1918, and 311 in 1919, distributed as follows:

1917: July, 0; August, 0; September, 2; October, 2; November, 5; December, 7.

1918: January, 2; February, 10; March, 12; April, 18; May, 20; June, 38; July, 59; August, 56; September, 80; October, 90; November, 96; December, 107.

1919: January, 163; February, 148. One death was attributed to Vincent's angina in December, 1918.

WHOOPING COUGH

Twenty-two cases of whooping cough with no deaths were reported, one case each in the months of October and November, 1917, May, July and October, 1918; five in August, five in September, and two in December, 1918.

SCABIES AND PEDICULOSIS

Infestation with the itch-mite *Acarus scabiei* and with the clothing and body louse were prevalent at all times throughout the A. E. F., but very few organizations having escaped. Estimates of the incidence of these conditions based upon the bimonthly physical inspections of men were made by sanitary inspectors and surgeons of organizations and were recorded in the monthly sanitary reports. These reports are not susceptible of statistical summary or presentation for the A. E. F. as a whole, nor can a summary or incidence rate be based upon the records available in the Office of the Chief Surgeon, A. E. F., for any organization or administrative area over any considerable period of time.

The incidence of the itch and lousiness could well be taken as an index of the sanitary efficiency and general discipline maintained in an organization, although there were conditions of existence in trenches and dugouts in the combat area and of crowding on ships and in trains against which only the most determined and resourceful efforts of officers could prevail to prevent general vermin infestation. From the date of the armistice forward there was a progressive improvement in the situation, owing in large measure to the better facilities available for maintaining personal and clothing cleanliness and to the determination to send the men home free from all forms of infection and infestation.

Practically all troops arriving in the A. E. F. from the beginning of troop movements to the last shipments of replacements to relieve men in the Army of Occupation, showed 1 or 2 per cent infested on arrival at base ports in England and France. It is true also that, in spite of all precautions taken before embarking troops for return to the United States, lousiness was found constantly among troops debarking at home ports.

All our allies suffered throughout the war from body vermin to much the same degree as we did, and in spite of all the energy spent upon the problem, the prevention of lice infestation and of scabies in armies in active warfare has been accomplished by none.

WAR NEUROSES

Although the whole question of incidence, the diagnosis, prevention and treatment of nervous disorders will be treated of elsewhere, it seems important to record the fact that the communicable character of the war neuroses was recognized as being of sufficient importance as a cause of its spread, and susceptible of such prevention and control, to justify the segregation of these cases from other hospitalized acute or convalescent patients.

Early recognition, prompt, firm and definite treatment by medical officers specially skilled in psychopathology proved to be of the greatest importance in controlling the number of cases and in shortening the period of their disability.



SANITARY REPORTS, MONTHLY AND SPECIAL¹

By HAVEN EMERSON, A.M., M.D., OF NEW YORK

EVEN the presence of individual early, unrecognized or carrier cases of various of the communicable diseases in groups of men in the field or in fixed camps is not necessarily followed by an epidemic outbreak of the diseases, and in fact the increasing application of laboratory and clinical methods to detect the carrier, the preeruptive and the early stages of these diseases makes it evident that much of the safety which we are apt to attribute to segregation and quarantine should be credited to the factors of individual resistance and to dilution or avoidance of the contagium (infectious discharges), and of protection against the insects which serve as intermediate carriers.

Groups of men are rarely so intelligent or so well informed that they will, without expert guidance, establish themselves with proper regard for sanitation and hygiene in vessels, on trains, in camps, billets or in the field, even in the absence of combat conditions when time, space, materials, labor and means of communication are seriously limited. Human resistance to disease and the avoidance of excessive exposure to infectious material, or to insects conveying such, depend in general upon such simple elements and upon such well-known principles of sanitation or group housekeeping that the provision of these conditions would seem always practicable and attainable.

The measure of attainment, the reasons for failure in certain places and at various times in the history of the A. E. F., and the resources, devices, inventions and ingenuity applied to approach as nearly as possible the ideal are to be read in the official reports of the medical officers of commands, the authors of the monthly sanitary reports (Form 50 M. D.).

The monthly and, if necessary, special sanitary reports at any time were the main official means of contact between the medical officer in charge of the sanitation of troops and the head of the medical services, the Chief Surgeon, A. E. F.

The channels for transmission of sanitary reports are so clearly specified, and the privilege of the responsible medical officer of troops to forward critical comments upon uncorrected, insanitary conditions affecting the health of troops even when such reports reflect upon the performance of officers of other arms of the service, and of officers who are his superiors and in command of the troops is so well understood that there is no excuse for any remediable defect not being brought to

¹Prepared for the "Medical History of the War" and published by permission of the Surgeon General of the Army.

the attention of those in the highest positions and fully able to direct that action be taken if means permit.

Sanitary reports, before reaching the office of the Chief Surgeon, passed through the offices of the Commanding General of army or division or of section or other administrative district where they were referred to the appropriate surgeon for review. When approved, they came to the Office of Epidemiology for final review, reference for correction or further action, and, when satisfied, to be filed.

Inequalities in administration and in standards expected by the surgeons of the armies, sections, etc., were obvious. In one area all the reported defects and inefficiencies were explained away and condoned because of war emergencies. In another, no amount of handicap or inconvenience was allowed to deprive the men of a high standard of living conditions. By analysis of the conditions met with, by comparing the reports of sanitary equipment and administration with reports of communicable diseases and noneffectiveness of the command from preventable diseases, a fairly accurate estimate could be formed of the physical limitations forced upon the men and of the personal equation of the medical officer in charge. It must be admitted that only by direct personal observation on the spot could a true picture, sound conclusions or scientific judgment of cause and effect be based, but shortage of medical personnel and transportation forced the Chief Surgeon to use the formal written record instead of the personal report of expert field inspectors to keep in touch with the living conditions of the men.

Frequent errors in the formalities of transmission and indorsement of the sanitary reports, which were required to insure proper consideration of reports by the competent authorities through whose hands they were intended to pass, required corrective action, but much more serious defects were the failure of the report form to provide under the paragraph headings, 1 to 8, for many of the most important points in the sanitary survey of a camp or of troops, and the failure of medical officers to modify the form to include record of the new conditions facing them. In other words, a form designed for use in fixed posts in the United States did not meet the needs of our troops in France. Circular letter No A-3, C. S. O., May 8, 1918, called attention to the more important changes desired.

AMERICAN EXPEDITIONARY FORCES

FRANCE, MAY 8, 1918.

CIRCULAR LETTER NO. A-3.

From: Chief Surgeon,

To: Division Surgeon, Division.

Subject: Sanitary Reports.

1. Owing to the unusual conditions of service with the American Expeditionary

Forces, the following additions should be included in the sanitary reports of this expedition.

(a) Under Paragraph 1, "Public buildings, etc.," mention should be made of the degree of crowding, and an estimate of the floor space per capita should be given as nearly as practicable, where there is any question of adequate space for sleeping purposes.

(b) Under Paragraph 5, "Sanitary Appliances, etc.," there should be included a statement of the facilities for bathing and for laundering clothes and of their adequacy to meet the needs of the command.

(c) Under Paragraph 6, "Clothing of the Men," mention should be made of the facilities for drying clothes and the provision of clean clothing.

(d) Under Paragraph 7, "Character and causes of prevailing diseases, etc.," the prevalence of itch, body lice and other infestation with body vermin should be indicated, as well as a statement of the method used and the equipment available for their prevention and treatment.

(e) Under Paragraph 8, "Dates of semimonthly physical inspections, etc.," add the mean strength of the command for the month, which figure can be obtained from the adjutant.

2. Attention is invited to Par. 1387 A. R., to Paragraphs 182, 414, 415, 416, 417, M. M. D., 1917, and to Circular No. 22, C. S. O., S. O. S., 17, April, 1918.

WALTER D. McCaw,

Colonel, Medical Corps,

For, and in the absence of, the Chief Surgeon.

Since the sanitary reports are not susceptible of statistical presentation, a summary of the experiences of the A. E. F., under the paragraphs as they appear on Form 50 M. D., will be given:

Buildings and Grounds.—"Paragraph I. Public buildings and grounds or camps and their surroundings."

Owing to the publication of G. O. 46, G. H. Q., October 10, 1917, Paragraph I, subparagraph 3, the impression was prevalent among not only officers of the line but in the Medical Department that the provision of 20 square feet of floor space per capita in billets or barracks was adequate for living purposes. This impression, backed by the authority of the printed word, stood in the way of improvement in housing of the men in many places where 40 square feet per capita, the lowest safe allowance, was obtainable with but little difficulty. That not more than 20 square feet per capita could be provided in many areas by barracks or billets or both in the A. E. F. was obvious, but it was remarkable that as soon as some medical emergency arose, such as an epidemic of diphtheria, meningitis, pneumonia or influenza and a certain temporary and added respect was given to the protest of medical officers at the insufficient floor space, an ample increase was usually provided by tentage, extra billets and accommodations in all sorts of buildings. After months of effort by the office of the Chief Surgeon, and the presentation of conclusive reports as to the relationship between crowding

and preventable disease, a concession in the way of Bulletin 94, G. H. Q., November 21, 1918, permitting the provision of 40 square feet where possible and admitting the insufficiency of 20 square feet as a sanitary ideal, was granted, but even to the very last months of the A. E. F., the influence of G. O. 46 so far prevailed that it was no uncommon thing to have reports include, under paragraph 1, a statement: "No overcrowding, 20 square feet per capita provided as authorized by G. O. 46," or "Ample space in barracks, 20 square feet of floor space provided per capita." Among the sanitary reports for April, 1919, a command of 5,393 men at Neufchateau was reported to have less than 19 square feet per capita in billets in the town.

Accepting all the limitations imposed by insufficient housing as unavoidable, it is considered to have been unwise, if only from an educational standpoint, to publish as authorized, and apparently to accept officially as adequate, an allowance of space per man in buildings less by half than has been heretofore found safe for living purposes for the troops in the United States and in the armies of our British and French allies, and only one-third of the minimum approved in our barracks in peace time. Relationship between crowding and disease, especially the respiratory infections, and the favorable results of "thinning out" upon the development of secondary cases of all this class of diseases are too well known to call for specific instances here. The special reports of investigators of epidemics by medical officers from the Central Medical Laboratory are full of cases in point. In general, wherever 40 square feet per capita were provided, there were found a low sick rate and a good standard of living conditions. Although much could be done and was accomplished in diminishing the hazards of overcrowding by open window ventilation, by separation of the heads of sleepers by partitions of various kinds between bunks and by alternate head to foot arrangement of adjacent sleepers, it was accepted generally that air space above 10 feet from the floor and cross window ventilation and other resources were of less importance than the provision of more floor space per man indoors.

Disposal of Waste.—"Paragraph 2. Drainage, sewage and disposal of wastes."

Description of constructions of various kinds to facilitate the sanitary disposal of wastes will be found in another chapter of the "Medical History of the War." In general the problems of drainage in France were rendered difficult by the fact that many of the camp sites were located upon low ground where the surface or subsoil was a clay thoroughly saturated with water at most seasons of the year. Rainfall was high, and the lack of road-beds or of cinders, gravel or wood for paths made it difficult and in many places impossible to keep areas between

buildings from being deep mud puddles rather than places fit to walk in, even when a considerable amount of ditching was done.

For the same reasons the fluid wastes from kitchens, washhouses and latrines could not be disposed of by soakage pits or subsurface drainage methods in the majority of cases. Latrine wastes were carted off to be used for field fertilizer, or buried in trenches, or burned, where cesspools or sewage disposal systems were not available.

Kitchen waste was given away or sold for hog feed or used in piggeries maintained by camps. In areas where there was a sufficient concentration of troops, and transport was available, salvage of fats and other food waste products was undertaken on a large scale by the Quartermaster Department. Elsewhere burial or incineration was resorted to for food waste as for combustible trash from the camps.

The standards of mess operation, latrine service, and the disposal of food wastes and feces were low pretty generally throughout the A. E. F. in the first year, after which greater attention was paid to these elements of sanitation, and by January, 1919, the results were good and conditions satisfactory.

Sanitary Appliances.—"Paragraph 3. Sanitary appliances (filters, sterilizers, incinerators, odorless excavators, etc.)."

Except for the provision for filtering and chlorinating water by motor-driven machines of the Wallace and Tiernan type and by various kinds of fixed installations built by the water supply engineers, the Lyster bag was practically the only contrivance in universal use for water sterilization, although water carts, water barrels and other containers were used where convenient.

The results of insufficient water discipline and of irresponsible supervision of the chlorination of water for drinking led to a few typhoid outbreaks. Two interesting contributions to the paraphernalia of field sanitation came to us from the British by whom they had been developed to a high state of usefulness; first, the feces destructor of the Horsfall type, with or without facilities for heating water or using waste heat for drying wet clothing; and, second, the dry air delouser of the Jacobs and the Orr (Canadian) models. The economies of the feces destructor, its total inoffensiveness when intelligently operated, and its great convenience under all conditions except those within gun-fire distance of the front were never fully appreciated or availed of by the A. E. F.

Bodily and clothing cleanliness, the importance of which in maintaining health and morale was generally appreciated by the Medical Department, were not attained without special effort to facilitate bathing and laundry work. The idea that "roughing it," looking dirty

and acting "tough" were necessary and laudable in army life was prevalent. The best way to meet this was to provide facilities ready at hand and so organize the use of them that a weekly bath and change of clean underclothing could be insisted upon. The pressure applied through sanitary reports which noted adequacy or insufficiency of such facilities was no inconsiderable factor in raising the standards of cleanliness so that scabies, louse infestation and the various secondary pyodermias played a continually lessening rôle in noneffectiveness from disease.

Each command was expected to provide conveniently placed wash benches under cover, a bath house with hot water, and hot water available for clothes washing.

Water Supply.—"Paragraph 4. Water supply."

The detailed consideration of the whole problem of water supply is so admirably presented elsewhere that it is only worth while to note here that the routine report of quality and quantity of supply under this paragraph in the sanitary report served at all times as a measure of the success or incompleteness of the general program of protection of supplies, and of the degree to which organization commanders succeeded in maintaining water discipline adequate to protect their men against intestinal waterborne infections.

Food Supply.—"Paragraph 5. Food supply and its preparation."

As in the case of the water supplies, so under this heading not more than passing comment is required, since elsewhere the system of inspection and the methods and results of control of food and nutrition in the A. E. F. from the central medical laboratory are given in full. In many instances, particularly in the earlier months of the existence of the A. E. F., the comments, complaints and recommendations with regard to food supply, preparation and serving were of great value in focusing attention upon the defects and directing the special investigators to the places and towards the conditions which needed urgent attention. The surfeit of meat, the insufficiency of sweets and green vegetables and fruits were the outstanding complaints, and at the same time on all hands there was a dearth of competent permanent cooks capable of doing the best under existing limitations with the food as supplied.

The shifting character of the K. P. personnel and the total lack of pride or self-respect in 99 per cent of the men while on this duty forms perhaps the most serious danger in the food preparation and service problem, for in many instances the origin of enteric disease outbreaks were traced to a K. P. who had not been examined as to a possible carrier state, while the temporary character of the assignment made any

consistent sanitary supervision of these men almost, if not quite, impracticable.

Clothing.—"Paragraph 6. Clothing of the men."

There were times at the base ports and at the front when, owing to unavoidable circumstances or lack of appreciation of the weather to be expected, many thousands of men were so inadequately provided with blankets and thick underclothing that they suffered severely from exposure to cold and wet. Diarrheas, acute respiratory infections and exhaustion contributing to surgical shock were all believed to be at different times and places, due in some measure to insufficient clothing. Furthermore, the prevalence of louse infestation and scabies required changes of underclothing and renewal of much of the outer clothing in the process of delousing to an extent not always provided for.

Of importance quite equal to that of sufficient warm body clothing and blankets was the provision of waterproof clothing and shoes as well as facilities for drying at night the shoes and outer clothing which were commonly soaked day after day for months at a time. Drying rooms had been found indispensable by the British, and by degrees were provided very generally throughout the A. E. F. A dirty, wet, cold man cannot give his best service or maintain his health.

Prevailing Disease.—"Paragraph 7: Character and causes of prevailing diseases and measures taken to prevent them."

Since daily telegraphic reports of certain communicable diseases were required, the monthly summary under this heading was of relatively little value except to indicate the general prevalence of non-communicable or nonreportable diseases, and the opinions of the medical officer as to causes, and his action directed towards prevention. The prevalence, however, of louse infestation and scabies in a command, being a new experience to most of the medical officers with troops, was not at first thought to be important enough to report. By insisting upon inclusion in the monthly report of the incidence of these affections, together with a statement of provisions available and in use for their elimination, the importance of the problem was kept before the medical officers and their arguments for delousing and bathing outfits were just so much the stronger with their commanding officers.

Physical Inspections.—"Paragraph 8. Dates of semimonthly physical inspections of the commands (by organizations)."

"(a) Number of new cases of venereal disease; rate per thousand of strength.

"(b) Number of venereal prophylactic treatments given."

Since the whole subject of venereal disease incidence, the organization for its control, etc., will be fully described elsewhere, little comment

under this heading is needed here. The amazing thing about the reports received was the fantastic calculation of rates. From lack of elementary knowledge of arithmetic or because of unfamiliarity with the English language, medical officers signing the sanitary reports were guilty of all possible errors in statements of "Rate per thousand of strength." In order the better to check the errors and bring something like honesty into the records, a statement of the mean strength of the command for the month was called for. Mistakes in calculation of the monthly rates were the commonest errors to the very end of the existence of the A. E. F.

Recommendations.—"Paragraph 9. Recommendations."

Unless indorsement showed that there had been adequate action so far as conditions permitted to meet the recommendations of the medical officer, the report was returned for a statement of action taken or reasons why the recommendations were not followed, and, if occasion required it, inspection from the office of the Chief Surgeon or the surgeon of the army or section concerned was made to settle questions of fact and policy.

The sanitary report in its present form falls short of its full possibilities of usefulness. Recognizing that the modern sanitarian has the duty of applying his knowledge of the relationship of environment and human contact to the prevention of disease, his report must include what are often spoken of as epidemiological observations—that is, a more detailed description of the conditions which permitted disease to occur, with an analysis of its distribution during the month and throughout the organization.



OPINIONS BASED ON INTELLIGENCE TESTS AT STATION HOSPITAL, FORT McPHERSON, GEORGIA

BY MAJOR ALEXANDER T. COOPER

Medical Corps, United States Army

This article was forwarded through Lieut. Col. P. C. Hutton, M. C., U. S. A., who says in his letter of transmittal:

"Personally my own observation in matters pertaining to these mental tests has not led me to be enthusiastic on the subject, but there is no objection that I can see to publication of this paper."

In the June, 1921, number of *THE MILITARY SURGEON* an editorial appeared relative to this same subject, intelligence tests, in which we expressed the opinion that too much reliance could not be placed on any cut and dried scheme for the determination of the ability of an individual or a group of individuals.

While it is undoubtedly true that certain tests of this character will discriminate in intelligence as the Binet test will differentiate between those of normal mentality and those of arrested development, the fact still remains that, however hard and fast the rules which govern any test or set of tests may be, the ultimate interpretation is dependent on the personal equation of the individual who makes the final reading.

We publish this article in the hope that it may elicit some discussion, either pro or contra, by others of the association who may have decided views on the subject.
—THE EDITOR.

ON DECEMBER 1, 1920, there were approximately one hundred and fifty-seven enlisted men of the medical detachment on duty at Fort McPherson, Ga. Most of these men were recruits, having been recently taken into the Army because of the recruiting drive which was then on in an effort to bring the Army to 280,000. There were a few who were old soldiers, having had several years' experience, and some who had had war service.

Due to the unfamiliarity of the officer in charge of the hospital, who had just reported for duty, and also the detachment commander, with the ability, intelligence and other characteristics of most of the medical detachment, it was thought that, in assigning enlisted men to the various duties throughout the hospital, it would be of considerable benefit in aiding these officers to bring about proper assignment of men to suitable duties if their psychological ratings were obtained; so that a man would not be assigned to a more responsible duty than that which he was intellectually capable of learning to perform; and, at the same time, the most intelligent men be assigned such duties as they were intellectually capable of doing.

In this test the Group Examination, Alpha Test, was used, as outlined by the Division of Psychology, Medical Department, U. S.

Army, and authorized by the Surgeon General's Office, February 8, 1918. It must be borne in mind that this test does not in any way size up a man's loyalty, his integrity, his industry, his courage, or numerous other qualities, but is simply a test of a man's intellectual keenness—the brains, if you please, that God gave him. In other words, it gives you an idea of how much of an intellectual load he is able to carry, or can be trained to carry.

Nine months after this test was made the writer has become practically personally acquainted with all of the men who were tested and is able to give his individual and personal opinion as to their abilities and value to the detachment. It was thought that this comparison of the psychological rating, with the opinion of their various abilities arrived at by an officer under whom they have been serving for several months, might be of interest. It should be borne in mind, however, that this is simply an individual and personal opinion of one man as to what these men are and as to how they have performed their duties, and what they might be capable of. Another person under whom they may have been stationed undoubtedly might have arrived at different opinions than those given for each man.

Of these hundred and fifty-seven enlisted men, three made an "A," or "Very Superior Intelligence." Analysis of these three is interesting. Two of them are staff sergeants; one had been a commissioned officer during the war, had made good, and is noted for making good in anything he takes up, while the other staff sergeant was a young man twenty-three years of age, also noted for making good in anything he undertook, but who had not before this time been placed in any position of great responsibility. However, he had a reputation of going out of his way to find things to do and doing them right. These two men are the type of noncommissioned officer that it is a comfort to have in any organization, and they quickly learn how to do things and do them correctly. The other one making a grade of "A" was a recruit, enlisted just a short time before this test was made. He had been put on kitchen police and was found working in the kitchen, scrubbing pots and pans. After this test he was relieved from this work and given a job as clerk in the record office. He is twenty-two years of age, is a bright and industrious young man, and has developed into an excellent clerk, learning everything pertaining to the office very rapidly.

Making, then, a snap judgment on the three men rating "Very Superior Intelligence" as to their potential value to the organization, and basing this opinion on their intelligence rating, one would not have gone wrong, as subsequent acquaintance of the men proved.

Of the hundred and fifty-seven men tested four made a grade of "B," or "Superior Intelligence." One of these men was a staff sergeant who, at the time the test was taken, was first sergeant of the detachment. His work had not been going satisfactorily, and it was a question as to whether he was capable of handling it as far as his intelligence was concerned, or whether he was temperamentally unfit. With a grade of "B," or "Superior Intelligence," it would appear that he was temperamentally unfit for his job and, if he were properly placed, would give excellent service to the Government. He was placed on duty in the dispensary, in the operating room, and from there he went into the record office, where he has done excellent work.

Three privates also made the grade of "B." One of these men was found doing kitchen police, scrubbing floors and washing dishes. He was relieved from this duty and put on duty understudying the mess sergeant, and given instruction in clerical work. He has proven himself to be excellent material for a noncommissioned officer grade and, during the absence of the mess sergeant for a month, successfully ran the hospital mess.

Another man who was a private, rating "B," took the examination for sergeant, passed it and was put on duty in the supply office. He became dissatisfied with the Army and has since been discharged because of reduction in rank, but his work showed him to be, as far as intelligence was concerned, of superior intelligence, and he was fast developing into a capable supply sergeant. The other private was a man who is usually described as bright, but a ringleader in all sorts of trouble in the detachment. He failed to make good in any detail which he was given. This man certainly had superior intelligence, but lacked industry, lacked a spirit of loyalty to his superiors, and was practically worthless because of these traits, but not because he had no brains.

Basing, then, our opinion of the capabilities and worth to the organization of men who made a "B" grade or "Superior Intelligence" on their ratings, one would have been 75 per cent right; i.e., three men out of the four subsequently proved to be excellent soldiers, and these three were of noncommissioned officer stuff and excellent men for the detachment.

Fourteen men made "C plus," or "High Average Intelligence." Four of these have since proven themselves to be very excellent non-commissioned officer material. Four are in training for promotion and, as they get a little older and gain in experience, should make good noncommissioned officers. The remaining six are nondescript, show no particular ability, and are of the average run of soldiers. Of

the fourteen, eight—or 57 plus per cent as noted above—are of non-commissioned officer material and extremely desirable men to have as members of the detachment.

It would appear from these figures that one is more than 50 per cent right in picking desirable men, basing the opinion solely on a "C plus" intelligence rating.

Forty-two of the hundred and fifty-seven made a grade of "C," or "Average." Among this number there were found three excellent men who were noncommissioned officer material, six who were very good material, while the remaining thirty-three were the average run of enlisted men taken in as recruits and developed into the average soldier. No men of exceptional qualifications appeared among this last thirty-three, many of whom, however, were good workers in a limited capacity where a high grade of intelligence was not needed, and in the performance of purely manual duties.

Thus it appears that the chances of obtaining a man with exceptional qualifications and ability from among men rating "C," or "Average" intelligence, frequently obtains, but the percentage is decidedly less than among men rating "A" or "B" or "C plus," and considerably under 50 per cent.

Fifty made a grade of "C minus," or "Low Average." Among this number we found a corporal who was unable repeatedly to pass the sergeants' examination; but, because of his loyalty, industry, tact and natural inclination to keep floors, toilets and bath tubs clean, makes an excellent noncommissioned officer in charge of a ward. Four men of this rating—i.e., "C minus"—are fairly good as ward masters with a grade as private first class, not, however, capable of assuming any greater responsibility. The remainder are men upon whom little or no responsibility can be placed. Many of these are honest, and their work depends not upon what they know or what they can be taught, as they cannot be taught a great deal, but upon their industry, integrity, and their willingness to do manual tasks.

Sixteen made Class "D" intelligence rating, or "Inferior Intelligence," and twenty-eight gave "D minus," or "Very Inferior." Among those who rated "D" or "D minus" were found a limited number of very excellent soldiers, as far as integrity, industry and loyalty are concerned, and some of these men have made themselves invaluable in doing work pertaining to manual labor or in which little intelligence is required. In this class were found hospital painters, carpenters and cooks, as well as excellent mop hands. However, none as yet have been found who have proven themselves capable of assuming any responsibility usually placed on the noncommissioned officer type of soldier.

It must be borne in mind that in any detachment or organization of this kind there must be the "hewers of wood" and "carriers of water" as well as men with intelligence, and the man who can scrub a kitchen floor after being shown how to do it, and get it clean, is as valuable in his place as a man who is capable of being sergeant in charge of a detachment, or supply sergeant. The man of inferior intelligence will, as a rule, be satisfied to remain at manual labor as long as he lives, while the man of superior intelligence cannot be long kept at this work but must be promoted as fast as he shows himself capable of being promoted to more responsible positions, or he will become dissatisfied.

Intelligently used, the psychological test may be of considerable value when a new organization commander must deal with new men, as it certainly will give him an insight into a man's keenness of perception and of what he is capable of doing intellectually. Relatively speaking, it may be stated that a man of very superior intelligence, or "A," if he will study and apply himself, is of commissioned officer stuff. As noncommissioned officers they are, other things being equal, capable of handling any job well and a real joy to an organization commander. "B," or "Superior Intelligence," as a rule, will give a high type of non-commissioned officer and a few of commissioned officer material in selected individuals throughout the Army. The great mass of non-commissioned officer stuff must come from "Average" and "High Average," as these men have the intelligence to become good noncommissioned officers. It is only the exceptional men in "Low Average" and below who have the qualifications of noncommissioned officers. Among these men you will find the laborers, mechanics, and men who prefer and are able to do things with their hands rather than things with their brains.

The apparent conclusion from this limited observation, then, would seem to show that, as a rule, "A" and "B" men are excellent men to have in any organization, as in the large majority of instances they can rapidly be taught any duties and assume the tasks of responsible positions. This statement also applies to those rating "High Average," or "C plus," though to a lesser degree, while, for those rating below "Average" or "C," it is the exception to obtain men of noncommissioned officer caliber.



STATISTICS OF VENEREAL DISEASE IN THE NAVY

By MARY AUGUSTA CLARK

Statistician of the American Social Hygiene Association

THE Annual Report of the Surgeon General of the Navy for the Fiscal Year 1920 is a volume of 326 pages, including 103 pages of statistical tables. This report completes the account of the Navy's participation in the World War and discusses the problems of changing from a war to a peace basis and adjusting to new conditions unlike those existing before the war.

The problem of the prevention and control of the venereal diseases is recognized as highly important. Typical of statements concerning its seriousness is the following sentence appearing in the report of the Surgeon of the Atlantic Fleet (page 51): "Venereal disease still holds the stage as one of the greatest evils we have to combat." While the importance of the problem is conceded throughout the report, the statistical evidence as to the extent of the damage done by venereal disease is very briefly presented.

In a section of the report bearing the title, "The Health of the Navy, Epidemiological and Statistical Data," the effects of various important communicable diseases are discussed. Evidences of the importance of any disease are admissions, lost days, deaths and discharges reported as due to that disease. It is significant that, of the seventeen pages of this section, seven pages are given over to the discussion of venereal diseases. The effects of these diseases, as reported during the calendar year 1919, are summarized in Table 1.

The comments on these figures which appear in the report may be quoted in full (page 215):

For the calendar year 1919 the admission rate for venereal diseases as a class was 111.62. This rate is higher than rates obtaining during the war—88.71 for 1917 and 70.18 for 1918—but considerably lower than the rate for any year previous to the war. The mean rate for the five-year period 1912-1916, inclusive, is 154.79. The rate 111.62, therefore, represents a reduction of 27.8 per cent in the incidence of venereal diseases as compared with the incidence in previous years, and the difference, 43.17, means 12,898 fewer cases during the year than would have occurred had the admission rate been as high as in average years before the war. Inasmuch as the number of sick days per admission to sick list on account of venereal diseases averaged 14 during the five-year period mentioned, the saving in sick days amounted to 180,572 days, or the equivalent of full-time service of approximately 500 men for 365 days.

Several factors tended to cause high rates for venereal diseases during the year. For several months large numbers of men were granted leave and extended liberty in Paris, and in French and Italian ports as well as in England. Exposure rates and attack rates were high in such instances. The remark made above with regard to

TABLE 1.—*Veneral Diseases in the United States Navy in 1919*
(Report of the Surgeon General of the Navy for 1920, pages 221 and 286)

Entire Navy

Diseases	Number	Ratio
<i>Admissions</i>		
Syphilis (all).....	4,920	16.45
Chancroid.....	8,019	26.84
Gonorrhea.....	8,019	68.32
Veneral diseases (all).....	33,350	111.62
<i>Sick Days</i>		
Syphilis (all).....	169,359	†
Chancroid.....	91,018	†
Gonorrhea.....	298,044	†
Veneral diseases (all).....	558,421	*1,869.04
<i>Deaths</i>		
Syphilis (all).....	10	†
Chancroid.....	.....	†
Gonorrhea.....	1	†
Veneral diseases (all).....	11	0.04
<i>Invalided from Service</i>		
Syphilis (all).....	230	†
Chancroid.....	4	†
Gonorrhea.....	485	†
Veneral diseases (all).....	719	2.41
Average complement.....	298,774	.....

*Number absent per 1,000 during entire year.

† Not given in report.

the effect upon morbidity rates of the substitution of recruits for trained men leaving the service applies to the venereal diseases as well as to other communicable diseases. Recruits do not especially tend to increase the admission rate for venereal disease while at the training station, but do for a while after getting out into the service at large. At present, admission rates for shore stations in the United States, exclusive of receiving ships, vary from 55 to 75 per 1,000 per annum. On account of the nature of the activities carried on at receiving ships it is not to be expected that admission rates will average as low as for other stations.

It is to be borne in mind that certain factors which made for low admission rates

n 1917 and 1918, such as the effect of appeal to patriotism, excitement of war, and greater demands of active duty in war times, are not operative now. However, the national program for the prevention and control of venereal diseases, and correction of social conditions which make for their spread, has now been adopted by all states but one, and the nation-wide campaign against these diseases may be expected to have its effect upon admission rates for venereal diseases in the Navy during the years to come.

The measures for prevention and control of venereal diseases adopted in the Navy are described, and the importance of supplementing the program of the Navy by cooperation with programs for securing control in civilian communities "where the greater part of the problem really lies," is emphasized. "The complete program," as the report states, "requires the organized and coordinated efforts of the United States Government, state governments, state and local health departments, and such unofficial agencies as the American Social Hygiene Association, universities, colleges, and local business, social and social hygiene organizations."

The reports of the medical officers of fleets, ships, hospitals, navy yards, marine stations, brigades and barracks contain many scattered items concerning the prevalence of venereal diseases among the men under their charge. Interesting opinions are expressed as to factors influencing infection rates and the values of measures for prevention and control. Free and varied criticisms are offered. The most interesting suggestion as to methods of evaluating proposed measures is made by the Surgeon of the Asiatic Fleet, who says (page 93):

The practical value of deterrent propaganda of any sort can be measured in no other way than by its influence upon the rate of exposure to infection. The rates per thousand of admissions to the sick list do not show this. They show only the failures of treatment to prevent disease. The only means we have to ascertain that factor is our record of venereal prophylactic treatments, or, in other words, the voluntary admitted exposures. It is suggested, therefore, that as a measure of effectiveness of any form of antiveneral propaganda medical officers should keep and tabulate the records of exposure as well as the records of venereal incidence.

No summaries of the data presented in these various reports are given, but it should be noted that this Report has been supplemented by statistical studies of various phases of the problem which have been published from time to time in "Notes on Preventive Medicine," the monthly bulletin of the Division of Preventive Medicine.

Recruiting figures are of interest because of the indication they give concerning the prevalence of venereal disease infections, serious enough to prevent enlistment, among men of the type desiring to enter the Navy. Medical officers examined 147,017 applicants for enlistment during 1919 and of these rejected 67,460. Venereal diseases were the cause for rejection of 2,522 cases, or 3.74 per cent of all rejections by

medical officers. The group rejected because of venereal disease infections constitute 1.72 per cent of the total group examined. Among 22,055 applicants for enlistment in the Marine Corps, 12,073 were rejected for physical reasons. Of these rejections, 281, or 2.33 per cent, were on account of venereal disease. Infections severe enough to be a cause for rejection were found in 1.27 per cent of the total (page 318). In the group of 774 candidates for admission to the Naval Academy at Annapolis, only one candidate was rejected because of venereal disease infection (page 135).

There is reference to the fact that physical examinations are given to applicants for enlistment in the Navy Nursing Corps (page 42). These examinations are made by civilian physicians, and their reports are submitted for review by navy medical officers. No tabulation is given of the results of the examinations. Such tabulation would furnish valuable data concerning the health of this group of women for comparison with data concerning men who offer themselves for enlistment. It would be of particular interest to determine the extent of venereal disease infection in this group.

There is no suggestion that statistical analysis will be made of the large number of records of physical examinations accumulated during demobilization. More than 700,000 of these records have been checked, indexed and filed (page 42).

Other interesting data not referred to in the text of the report are found in the appended statistical tables. Table 2 reveals the fact that the Navy includes groups engaged in a wide variety of occupations. It is further evident that infection rates in these groups also vary widely. The lowest admission rate, 0.99 per 1,000, is found among the midshipmen, and the highest, 299.73 per 1,000, among the culinary forces. Among officers the rate was only 21.04 per 1,000. No distinction of sex is made, but it would be of interest to know the proportion of women included in the clerical and hospital forces, where the rates are 48.75 and 43.48 per 1,000 respectively. The rates of the two large and important groups, marines and seamen, are approximately the same as the rate for the entire Navy.

The extent of the venereal disease problem is revealed in Table 3, where the rates for the group of venereal diseases are compared with the rate for all diseases taken together. Nearly one-fifth of all admissions, and one-seventh of all sick days, result from venereal disease infections.

In reporting diseases, the Navy follows its own nomenclature instead of the International Classification. The six leading groups of diseases, as classified by the navy nomenclature, which caused admis-

TABLE 2.—*Venereal Disease Cases and Ratios Per 1,000 Average Complement in Important Occupational Groups in the United States Navy in 1919*

(Adapted from Report of the Surgeon General of the Navy, page 286)

Entire Navy

Occupational groups	Average complement	Admissions because of venereal disease	
		<i>Number</i>	<i>Ratio</i>
Officers:			
Navy and Marine.....	21,765	458	21 04
Midshipmen.....	2,010	2	0 99
Artificers:			
Electricians.....	12,020	1,248	103 83
Engine-room.....	15,196	2,469	162 48
Fire-room.....	33,735	6,065	179 78
All others.....	15,608	1,072	68 68
Miscellaneous force:			
Clerical.....	21,312	1,039	48 75
Culinary.....	17,699	5,305	299 73
Hospital.....	8,900	387	43 48
Marines.....	30,884	3,436	111 25
Musicians.....	3,848	286	74 32
Prisoners.....	1,791	163	91 01
Seamen branch:			
Apprentices.....	13,337	1,048	78 58
Ordnance.....	5,638	631	111 92
All others.....	95,031	9,741	102 50
Total, all occupations..	298,774	33,350	111 62

TABLE 3.—*The Influence of Venereal Diseases on the Health of the United States Navy in 1919, as Shown by Percentages of Admissions, Sick Days, Deaths and Number Invalided from Service on Account of These Diseases.*

(Based on data in Report of the Surgeon General of the Navy for 1920, statistical tables, pages 287 and 289)

Entire Navy

Effect reported	Ratio per 1,000, venereal diseases	Ratio per 1,000, total for all diseases	Percentage venereal
Admissions.....	111 62	620 69	18 0
Sick days.....	1,869 04*	12,608 92*	14 8
Deaths.....	0 04	4 02	1 0
Invalided from service.....	2 41	43 43	5 5

*Number absent per 1,000.

TABLE 4.—*The Influence of Leading Groups of Diseases, Classified by the Navy Nomenclature, on the Health of the Navy in 1919 as Shown by Admissions and Sick Days on Account of These Diseases.*

(Rearrangement of data in Report of the Surgeon General of the Navy for 1920, pages 286 and 287)

Entire Navy

Diseases, by class of disability	Number	Ratio
<i>Admissions:</i>		
1. Diseases of respiratory system	41,951	140 41
2. Venereal diseases	33,350	111 62
3. Communicable diseases transmissible by oral and nasal discharges	31,643	105 91
4. Diseases of digestive system	19,420	64 99
5. Other diseases of infective type	9,706	32 49
6. Diseases of genito-urinary system (non-venereal)	7,640	25 57
Total, all diseases	185,447	620 69
<i>Sick Days:</i>		
1. Communicable diseases transmissible by oral and nasal discharges	582,694	1,950 28*
2. Venereal diseases	558,421	1,869 04
3. Diseases of respiratory system	516,304	1,728 07
4. Diseases of digestive system	372,862	1,247 97
5. Tuberculosis (all forms)	278,309	931 50
6. Diseases of motor system	172,989	578 99
Total, all diseases	3,767,218	12,608 92

*Number absent per 1,000.

sions and sick days are shown in Table 4. The group of venereal diseases ranks second in importance in both cases. Diseases of the respiratory system, a group including tonsillitis, both acute and chronic, caused more admissions than the venereal diseases, and the group including influenza and pneumonia accounted for more lost days.

Data on the admissions reported for leading groups of diseases among officers are also shown in the statistical tables and are shown in Table 5. While the rate of admissions for venereal disease among officers appears low when compared with the rate in the entire Navy, the rates for admissions in all other groups of diseases are also low, and the venereal diseases rank fourth, relatively high, among the leading groups.

TABLE 5.—Admissions to Sick Report on account of Leading Groups of Diseases,
Classified by Navy Nomenclature, Among Officers of the Navy During 1919

(Source same as Table 4)

Navy Officers

Diseases, by class of disability	Number	Ratio
1. Diseases of respiratory system	2,096	96 30
2. Communicable diseases transmitted by oral and nasal discharges	1,559	71 63
3. Diseases of digestive system.	1,387	63 73
4. <i>Venereal diseases</i>	458	21 04
5. Diseases of genito-urinary system (non-venereal).	408	18 75
6. Other diseases of infective type.	368	16 91
Total, all diseases	8,050	369.87



VENEREAL DISEASES IN THE UNITED STATES ARMY

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THE Report of the Surgeon General of the Army for the Fiscal Year Ending July 30, 1920, is a volume of 755 pages, including the appendix of statistical tables covering 268 pages. In his letter of transmittal, page 16, the Surgeon General points out factors which tend to make the health conditions during the calendar year 1919, the period described in this report, unusual. Important factors noted are the continued influenza epidemic in the early part of 1919, detection of disability and disease among men demobilized as a result of the thorough physical examination to which each man was subjected and the definite policy of the War Department to retain, under treatment or in hospitals, all officers and men affected with tuberculosis or other chronic diseases until the maximum degree of improvement was attained. These unusual factors chiefly affect admission rates and number of days lost from duty because of sickness.

The section of the report bearing the general heading "Infectious Diseases" includes a report of the venereal diseases (page 179). Two interesting charts are presented, one showing the prevalence of venereal disease among enlisted men in the United States for each year from 1895 to 1919, and another comparing admission rates for each month of 1919 in the United States and Europe. The annual admission rate in the United States for 1919 was 87.36 per 1,000, which is decidedly lower than the rate for the two preceding years, 1917 and 1918, when the rates were 113.82 and 149.60 respectively. In 1919 the rate started low in January and increased to a maximum of 150.0 per 1,000 in July, decreasing after July until December, when the rate was about as low as in January.

The possible explanation of the very high admission rate in 1918, as suggested in the report, is of interest (page 179):

As the result of the Army experience gained in 1917 and 1918, it is evident that the admission rates for venereal diseases in the Army are largely increased during mobilization periods by the induction into the military service of a large number of men with infections contracted in civil life. An examination of the table showing the monthly admission rates for venereal diseases in the United States in 1918, appearing in the report of the Surgeon General for 1919, on page 962, shows that the highest admission rates occurred during the months when the highest number of men were being inducted into the service, and that during the latter part of the year, especially in November and December after the signing of the armistice, the rates registered a very material reduction.

Changes in rates during 1919 are also interpreted. The rise up to

September is attributed to the fact that enlistments were rather active in the early part of the year. The decrease following July is thought to be due to a large extent to the fall in admission rates of Negro troops and, to a less extent, to a slight decrease in enlistments of white troops. The Report suggests that some of the decrease is due to the renewal, with increased activity of the anti-venereal campaign. With the exception of influenza and the group of "respiratory diseases," the high admission rate in the United States of nearly 150.0 per 1,000 in July is higher than the rate reached during the year by the other infectious diseases discussed in the report.

The importance of the venereal diseases in the Army may be estimated by examination of the detailed statistical tables covering 268 pages, which show the extent to which diseases listed in the International Classification of the Causes of Death affected the health of the Army during 1919. The effect of each disease is indicated by number of admissions, days lost, deaths and discharges reported as caused by the disease. Both absolute numbers and ratios per 1,000 mean strength are reported. Ratios per 1,000 are the more useful form of report, since the strength of the different parts of the Army varies greatly. In the tables these facts are shown, not only for the entire Army but also for important subdivisions—the United States Army in the United States (including Alaska), the United States Army in Europe (excluding Russia), American troops in other countries and troops on transports. Under each subdivision of the Army, officers and enlisted men are tabulated separately, and enlisted men are also tabulated by color.

The facts reported about leading diseases—that is, the 10 diseases occurring most frequently under each of the effects reported—are summarized in tables in the text. Six important groups of the Army are selected for comparison:

1. Enlisted men, U. S. Army in the United States (including Alaska).
2. Enlisted men, U. S. Army in Europe (excluding Russia).
3. Enlisted men, U. S. Army in the tropics.
4. Officers, U. S. Army in all countries.
5. Native Filipino troops, Philippine Islands.
6. Native Porto Rican troops, Porto Rico and Panama.

In quoting figures on the prevalence of venereal diseases in the Army it is the usual custom to use figures for Enlisted Men in the United States. In the tables which follow, not only this group but also two other groups of special interest, Enlisted Men in Europe, and Officers in all countries, are included. The mean annual strength of these three branches of the Army is shown in Table 1.

TABLE 1—*Mean Annual Strength of the Army Serving in the United States and Europe During the Calendar Year 1919*

(Report of the Surgeon General of the Army for 1920, page 502)

<i>Troops</i>		<i>Mean strength</i>
<i>Enlisted men:</i> United States		306,963
Europe		546,738
<i>Officers:</i> All countries		55,554

The admissions and days lost because of the ten leading diseases are shown in Table 2, a copy of tables appearing in the report. Both syphilis and gonococcus infection, reported as separate diseases, appear in every table with the single exception that syphilis was not one of the leading causes of admission to sick report among officers. It is interesting to find, however, that as the cause of 430 admissions it ranks twelfth among leading diseases among officers, and would have appeared in the table had twelve instead of ten leading diseases been listed. Neither of these two venereal diseases is among leading causes of death or discharge.

The rank of the venereal diseases, when syphilis and chaneroidal and gonococcus infection are combined in a total group, among the leading diseases, clearly indicates their importance as an army problem. The data for the combined groups are shown in Table 3. Deaths and discharges are included in this table because the combined group of venereal diseases is a cause, to an appreciable extent, of death and discharge.

TABLE 3.—*The Influence of Venereal Diseases on the Health of the United States Army in 1919 as Shown by Admissions, Days Lost, Deaths and Discharges on Account of These Diseases in Three Important Branches of the Army*

(Report of the Surgeon General of the Army for 1920, Statistical Tables, pages 487-741)

Effect reported	Enlisted men				Officers, all countries	
	United States		Europe			
	Number	Ratio	Number	Ratio	Number	Ratio
Admissions . . .	26,815	87.36	30,020	54.91	1,672	30.10
Days lost	871,533	*7.78	902,995	*4.52	52,808	*2.60
Deaths	15	0.05	13	0.02	3	0.05
Discharges . . .	824	2.68	173	0.32	17	0.31

*Non-effective rate. See footnote †, Table 2

TABLE 2.—*The Influence of Leading Diseases on the Health of the United States Army in 1919, as Shown by Admissions and Days Lost on Account of These Diseases in Three Important Branches of the Army*
(Report of the Surgeon General of the Army for 1920, pages 117 and 131)

	Enlisted men				Officers, all countries			
	United States		Europe		Diseases		Diseases	
	Diseases	Number	Ratio	Diseases	Number	Ratio	Diseases	Ratio
Admissions	Tonsillitis, acute.....	25,681	83.66	Influenza (all).....	46,971	85.92	Influenza (all).....	63.42
	Brachitis.....	20,500	66.79	Brachitis.....	27,252	49.85	Brachitis.....	50.71
	Gonococcal infection.....	16,360	53.30	Mumps.....	17,774	32.50	Tonsillitis, acute.....	31.66
	Influenza (all).....	16,246	52.93	Gonococcal infection.....	15,587	28.51	Gonococcus.....	969
	Pharyngitis.....	14,920	48.64	Tonsillitis, chronic.....	11,587	21.20	Tonsillitis, chronic.....	17.35
	Syphilis.....	9,010	29.35	Scabies.....	9,411	17.22	Scabies.....	13.22
	Pharyngitis, acute.....	6,557	21.36	Syphilis.....	5,803	10.62	Pharyngitis, acute.....	669
	Rhinitis.....	6,233	20.31	Arthritis.....	4,516	8.26	Appendicitis.....	609
	Scabies.....	5,766	18.73	Otitis Media.....	4,196	8.22	Hemorrhoids.....	556
	Hernia.....	4,127	13.45	Appendicitis.....	4,312	7.89	Hernia.....	9.11
	Total (all diseases).....	239,297	779.56	Total (all diseases).....	262,142	479.46	Total (all diseases).....	497.79
Days Lost	Tuberculosis.....	4,129,086	10.08	Influenza (all).....	982,095	4.92	Tuberculosis.....	132,773
	Gonococcal infection.....	382,238	4.13	Brachitis.....	641,317	3.21	Influenza (all).....	63,659
	Influenza (all).....	382,251	3.41	Tuberculosis.....	554,343	2.78	Brachitis.....	2,922
	Mumps.....	292,754	2.61	Gonococcal infection.....	459,368	2.30	Hernia.....	1,443
	Brachitis.....	272,442	2.43	Mumps.....	330,931	1.66	Gonococcus infection.....	28,597
	Syphilis.....	265,145	2.37	Arthritis.....	293,719	1.47	Appendicitis.....	24,664
	Pharyngitis, acute.....	253,564	2.26	Brachitis-pneumonia.....	253,736	1.27	Arthritis.....	24,166
	Hernia.....	175,209	1.56	Lochar-pneumonia.....	240,443	1.21	Neurasthenia.....	19,149
	Dementia praecox.....	139,438	1.24	Syphilis.....	224,268	1.12	Syphilis.....	18,107
	Arthritis.....	134,471	1.19	Hernia.....	224,999	1.11	Tonsillitis, acute.....	17,978
	Total (all diseases).....	6,479,809	57.83	Total (all diseases).....	8,437,114	42.28	Total (all diseases).....	862,212
	Total (all diseases).....	6,479,809	57.83	Total (all diseases).....	8,437,114	42.28	Total (all diseases).....	862,212

* The report omits chancroid from this table, although there were 8,630 cases with a ratio of 15.79 per 1,000 admissions for this cause.

† Ratio here is ratio per 1,000 per day and is known as non-effective ratio, indicating the average number of men absent from duty each day.

Comparison of the figures shown in Table 3 with those showing prevalence of other leading diseases in Table 2, and with similar tables of deaths and discharges in the Report of the Surgeon General (pages 121 and 125), reveals the fact that the venereal diseases rank high. The exact rank or position they hold is shown in Table 4.

TABLE 4.—*Rank of Venereal Diseases Among the Leading Diseases Causing Admissions, Days Lost, Deaths and Discharges in Three Important Branches of the Army in 1919*

(First rank indicates largest number of cases)

Effect reported	Enlisted men		Officers, all countries
	United States	Europe	
Admissions.....	1st	2d	4th
Days lost.....	2d	2d	4th
Deaths.....	17th	18th	15th
Discharges.....	6th	15th	10th

The importance of the venereal diseases is also shown by determining what percentage of admissions, days lost, etc., on account of all diseases was due to these infections. These percentages are shown in Table 5.

TABLE 5.—*Percentage of All Admissions, Days Lost, Deaths and Discharges which were Due to Venereal Diseases in Three Important Branches of the Army in 1919*

Effect reported	Enlisted men						Officers, all countries		
	United States			Europe					
	Ratio per 1,000, ven. dis.	Ratio per 1,000, total all dis.	Per cent ven.	Ratio per 1,000, ven. dis.	Ratio per 1,000, total all dis.	Per cent ven.	Ratio per 1,000, ven. dis.	Ratio per 1,000, total all dis.	Per cent ven.
Admissions...	87.36	779.56	11.2	51.91	179.46	11.4	30.10	497.79	6.0
Days lost...	*7.78	*57.83	13.4	*4.52	*42.28	10.7	*2.60	*42.53	6.1
Deaths...	0.05	8.35	0.6	0.02	8.33	0.2	0.05	5.60	0.9
Discharges...	2.68	77.58	3.5	0.32	17.78	1.8	0.31	17.14	1.8

* Non-effective rate. See footnote 1, Table 2.

It has been evident throughout these tables that rates vary considerably from group to group. For example, one difference of importance is that rates for officers are lower than rates for enlisted men except in the case of deaths. Nearly one per cent of all deaths of officers were

due to venereal diseases. Many other examples of differences might be cited.

Details not included in Tables 1 to 5, but furnishing data for interesting comparisons, are shown in Table 6, a summary of all the facts about the venereal diseases in the groups discussed above, which are found in the statistical tables of the Report. Statistics of venereal diseases in the total army, officers, enlisted men and native troops, are also given. The statistics of the three venereal diseases, syphilis, chancroidal infection, and gonococcus infection, are shown separately as well as combined in a total group. The groups of enlisted men are tabulated by color.

Among comparisons made possible are those between white and colored troops. In the United States the ratio of admissions among colored troops was 290.05 per 1,000, more than four times as high as the admission rate of 67.78 per 1,000 among white troops. In Europe there was less difference, the ratios being 60.70 per 1,000 among colored and 44.42 among white troops.

Comparisons of damage due to syphilis and gonococcus infection are also important. In the United States gonococcus infection was reported about two and one-half times as often as syphilis, but was the cause of the loss from duty of less than twice as many days.¹

Demobilization figures are of interest as showing the condition of the men with respect to venereal disease infections after their service in the Army. Of approximately 3,350,000 officers and men examined prior to demobilization, 93.7 per cent were discharged with either no disease or with disability of less than 10 per cent. Of the remaining 6.3 per cent, 24,293, or .07 per cent of the total, were held on account of communicable disease, mostly venereal (page 203).

This favorable report of the health of the Army at demobilization is in part due to the work of the Division of Venereal Disease Control which was established in the office of the Surgeon General by an order dated August 29, 1919 (page 248). This division compiles weekly reports of venereal disease infections at all stations in the United States. Figures obtained from these reports do not agree entirely with permanent statistics compiled from official monthly sick reports, but general tendencies appear to be the same. It will be of great interest to learn whether permanent statistics compiled for the calendar year 1920 will approximately confirm the weekly rates reported for the period from

¹ An estimate of the cost of these infections in the total army is given in the Report of the United States Interdepartmental Social Hygiene Board for 1920, page 193. In a letter regarding the cost of the venereal diseases in the Army, the chief of the Division of Sanitation, Office of the Surgeon General, makes the following statement: "It may be conservatively estimated, however, that the actual loss to the Army caused by venereal diseases during the year 1919 was not less than \$15,000,000."

TABLE 6.—*Veneral Diseases in the United States Army in 1919*
(Summary of data in Report of the Surgeon General of the Army for 1920, pages 487-739)

Diseases	Enlisted men										Officers, all countries			Total army, officers and enlisted men, including native troops			
	United States Army in the United States, including Alaska					United States Army in Europe, excluding Russia											
	Colored		Total		Ratio	White		Colored		Ratio							Total*
	Number	Ratio	Number	Ratio		Number	Ratio	Number	Ratio								
<i>Admissions</i>																	
Syphilis.....	4,654	16.63	1,903	70.39	6,557	21.36	3,487	7.96	1,053	17.97	5,803	10.62	430	7.74	13,418	13.35	
Chancroid.....	2,459	8.78	1,553	57.44	4,012	13.07	5,784	11.85	1,402	21.93	8,630	15.79	273	4.91	14,205	14.13	
Gonococcus infection.....	11,060	42.37	4,386	162.23	16,246	52.93	12,006	24.60	1,102	18.81	15,587	28.51	969	17.41	33,995	33.82	
Veneral diseases (all).....	18,973	67.78	7,842	290.05	26,815	87.36	21,677	44.42	3,557	60.70	30,020	54.91	1,672	30.10	61,618	61.31	
<i>Deaths</i>																	
Syphilis.....	179,281	1.75	85,864	8.70	265,145	2.37	164,649	0.92	43,291	2.02	224,268	1.12	18,107	0.89	530,472	1.45	
Chancroid.....	83,415	0.82	60,735	6.15	144,150	1.29	172,277	0.97	35,496	1.66	219,359	1.10	6,104	0.30	409,752	1.12	
Gonococcus infection.....	366,538	3.59	95,700	9.70	462,238	4.13	394,461	2.21	31,911	1.49	459,368	2.30	28,597	1.40	983,176	2.68	
Veneral diseases (all).....	629,234	6.16	242,299	24.55	871,533	7.78	731,390	4.11	110,731	5.18	902,995	4.52	52,808	2.60	1,923,420	5.24	
<i>Deaths</i>																	
Syphilis.....	5	0.02	7	0.26	12	0.04	5	0.01	6	0.10	11	0.02	2	0.04	26	0.03	
Chancroid.....	2	0.01	1	0.04	3	0.01	2	0.00	.....	.....	2	0.00	1	0.02	6	0.01
Gonococcus infection.....
Veneral diseases (all).....	7	0.03	8	0.30	15	0.05	7	0.01	6	0.10	13	0.02	3	0.05	32	0.03	
<i>Discharges</i>																	
Syphilis.....	236	0.84	94	3.40	330	1.08	74	0.15	34	0.58	112	0.20	11	0.20	472	0.47	
Chancroid.....	5	0.02	19	0.70	24	0.08	1	0.00	.....	.....	1	0.00	.....	.....	25	0.02
Gonococcus infection.....	153	0.55	317	11.73	470	1.53	39	0.08	21	0.36	60	0.11	6	0.11	538	0.54	
Veneral diseases (all).....	394	1.41	430	15.90	824	2.68	114	0.23	55	0.94	173	0.32	17	0.31	1,035	1.03	
Mean strength.....	279,926		27,037		306,963		488,139		58,599		546,738		55,554		1,005,047		

* Total includes "color not stated."

† Ratios per 1,000 per day known as non-effective ratio, indicating the average number of men per 1,000 absent from duty each day, the number per 1,000 constantly absent.

January to July, 1920. These rates range from 34 to 62 and average about 50 per 1,000 per annum. In considering these figures it is important to remember that the average admission rate in the Army during the five years before the World War was 93.3 per 1,000, and during 1919 was 87.36 per 1,000.

Under the direction of the Division of Venereal Disease Control an attempt has been made through the use of questionnaires to study venereal disease conditions in the Army. One study (page 251) is based upon the reports by medical officers of the voluntary and confidential statements concerning the circumstances under which they contracted the disease, of all soldiers who are found to have become infected with venereal disease. A tabulation of 10,000 of these statements has been made.

Another questionnaire (page 253) is designed to furnish information about the sex habits of white men within the United States. Replies to the extent of 14,444 have been sent in and accepted for use. "This inquiry," it is concluded, "supports the belief that chastity is the most important factor in producing low rates in venereal disease incidence in the Army." The study also throws light on the efficacy of prophylaxis: "At the present time it may be said that venereal prophylaxis is not so efficient as to justify any man in assuming any risk of infection and counting upon its use to compensate for his lack of self-control, but is sufficiently effective to warrant its employment in the most thorough manner as a very important part of any campaign directed against venereal diseases."

Finally, recruiting figures are of interest as a possible source of information concerning the prevalence of the venereal diseases in two different groups of the civilian population—men of the type desiring to enlist in the Regular Army and candidates for the Reserve Officers' Training Corps. Physical examinations of men offering themselves for voluntary enlistment led to the rejection of about 61 per cent. Only 39 per cent became soldiers (page 211). "Active venereal disease" was a cause for rejection and at the six large recruit depots ranks fifth as a cause of rejection, accounting for 5.8 per cent of all rejections. Of the total number examined, 1.04 per cent were rejected because of venereal disease. This figure unfortunately gives no indication of the incidence of venereal disease among men applying for enlistment, since no report is given of the reasons for rejection in the recruiting stations, where about 50 per cent of the men were rejected. It may be stated, however, that of the group of men approved at these stations as physically fit and sent to recruiting depots for further examination, 1.04 per cent were rejected because of active venereal disease (page 218). It is interesting

to recall in comparison the amount of venereal disease found among drafted men. During mobilization of the draft army, when active venereal disease was not a cause of rejection, 5.6 per cent of the drafted men were found to be infected with venereal disease, and in only 0.4 per cent of the men were the complications serious enough to be a cause for rejection. ("Defects Found in Drafted Men," by Albert G. Love and Charles B. Davenport, page 429.)

Very different conditions were found among approximately 10,000 candidates for the Reserve Officers' Training Corps when they were examined by medical officers of the Army. Of these 1,519 were rejected for various physical causes, and only 4 men, 0.04 per cent were rejected because of venereal disease. Fewer rejections were made for venereal disease than for any other cause (page 221).

During the war 21,480 nurses were enrolled in the service of the Army, and through demobilization the number has been reduced to 1,551 (page 294). Complete individual personal histories, together with the records of the entire service of each nurse, have been compiled, but no tabulation has been made of the health conditions revealed by these records. Undoubtedly such tabulation would furnish interesting and important data concerning venereal disease among young women for comparison with the data which army reports furnish about young men.



THE IMPORTANCE OF ARTHRITIS AND RHEUMATOID CONDITIONS FROM THE MILITARY STANDPOINT

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THE impressions of observers in the allied armies and in this country during the recent war had forecast in some degree the importance of arthritis and rheumatoid conditions from the military standpoint and the scale upon which this problem would have to be met by the United States forces, but it remained for actual experience to translate these impression, into facts. During a preliminary survey there was obtained through the courtesy of Col. A. G. Love, of the Sick and Wounded Division, a calculated incidence of chronic arthritis alone, amounting to 40,000 cases a year for an army of about 4,000,000 men, but it is clear in retrospect that this number fails to take count of acute arthritis and of many cases of various nature actually belonging in the same category.

During the later months of the war General Hospital No. 9 at Lakewood, New Jersey, was made by the Surgeon General the center for the intensive study and treatment of this condition, chiefly for the reason that it was already equipped in large part for investigative work. The experience gained there in the study and treatment of 400 cases of arthritis among soldiers¹ has contributed to a new appreciation of the problem of acute and chronic arthritis from the combined military and civil standpoint, and, as the writer is convinced that society should, and eventually will, take wider cognizance of this large problem, he welcomes the opportunity to contribute the present article.

Investigation of the field of arthritis as a whole was approached from a considerable number of angles, although in retrospect it is clear that added personnel and further lines of effort would have been desirable. It is the purpose of this article, however, to attempt, not a discussion of the results obtained, although these will be briefly referred to, but rather a visualization of the problem in the light of past and continuing experience.

Four hundred cases of chronic arthritis were submitted to detailed medical examination and, in a great number of these, laboratory studies were conducted upon several phases of metabolism. One of the outstanding impressions derived related to the chronicity of the disease

¹Studies on Arthritis in the Army based on 400 cases. Pemberton, Buckman, Foster, Robertson and Tompkins. Arch. Int. Med., March, 1920, Vol. XXV, pp. 231-282; April, 1920, Vol. XXV, pp. 335-404.

even upon admission to the hospital and to the degree by which the civil community was encumbered with the subsequent, and perhaps permanent care of many of these cases. In other words, arthritis of whatever type must be regarded as constituting a problem comparable in nature to that presented by tuberculosis and gunshot wounds, although not equal in numbers to either. From the purely numerical standpoint it is further of less importance than the acute infectious diseases, but it is necessary to bear in mind that in most cases these last run an acute course with early termination and do not become chronic. It is not uncommon for cases of arthritis to continue for thirty years or more. Viewed in this light, even the question of tuberculosis may assume a secondary importance since, long before the lapse of such a period, most cases of the latter disease cease, in one way or another, to be social burdens.

It is interesting to review the causes of arthritis in the Army as revealed by statistical analysis. In contrast to civil life the incidence of arthritis among soldiers was attributable in 60 per cent of cases to exposure as the immediately exciting factor, and was comparable to an experiment on a large scale in the artificial induction of the disease. Probably because of this and because of the age of the subjects, as has been elsewhere explained, these cases as a whole were more remediable than are those usually met with in civil life. They therefore offer added justification for treatment, notwithstanding the chronic and refractory course which many of them run.

It is not to be supposed that the rôle of exposure as the chief precipitating factor minimizes the importance of focal infection in this class of subjects, although it is true that the part played by focal infection was apparently less significant than is the case in civil communities. The chief sites of such infection were the tonsils, teeth and genito-urinary tract in the order named, the influence of the last being almost negligible. It is also of interest to note that the site chiefly affected was the knee, which compares favorably with figures for civil life and suggests that the influence of drilling and the like in producing arthritis is not so great as might have been supposed.

In order to complete the brief survey which it is the purpose of this article to present, it is appropriate to outline here the chief facts which the above studies reveal relating to the pathology of the disease. There were observed among other things a subnormal basal metabolism in 20 per cent of the cases; a normal concentration of urea and nitrogen in the circulating fasting blood, which is against the popular conception of arthritis as a disease presenting difficulties in the nitrogenous elimination; normal values for blood calcium; normal values for blood fats and

cholesterol; increased values for blood creatin in half of the cases studied with the tendency for these increased values to be lowered as convalescence proceeded. There were also a slight lag in the elimination of salt and water and normal values for the carbon dioxide combining power of the blood. Perhaps the most interesting fact developed was in connection with a lowered sugar tolerance which was shown to accompany this disease rather closely and to return to normal as convalescence proceeded. This lowered tolerance was measured in the usual way by the so-called glucose tolerance test which consists in the administration of 100 grams of glucose by mouth and in the determination, before and after this, of the concentration of glucose in the circulating blood. The return of a lowered sugar tolerance to normal was independent of the method of therapy employed, but was most abrupt following the removal of apparently causative focal infection. In view of the widespread incidence of focal infection, these findings have a value wider than their application to arthritis alone and reflect part of the metabolic disturbance concerned.

Studies, conducted subsequently to the above, have further indicated that there is in arthritis a difficulty in the processes of oxidation, reflected in the fact that the venous blood of most arthritics has a higher percentage saturation of oxygen than that of normals. This seems to return towards normal with convalescence, but whether referable to a chemical or vascular mechanism is not yet determined. In either event, however, failure of the oxygen to leave the vessels means a lower delivery in the tissues, and this may explain in part the benefit which is known to accrue from both external and internal measures which increase blood supply and oxidation.²

It was apparent from a study of this large series of 400 cases that some of the accessory measures practiced in civil life in the treatment of this disease found larger value than was to be expected. This was especially true of hydrotherapy and external measures whose use dates back to the ancients of Greece and Rome, though their indiscriminate employment at uncritical hands has brought upon them a certain measure of disrepute. This disrepute is in some part undeserved, and these measures should be regarded as adjuvants in treatment, to be neither relied upon to extremes nor wholly discounted. The more or less artificial induction of arthritis by the exigencies of war, together with the youth of the subjects, was doubtless responsible for the success which followed the wide use of hydrotherapy, etc., in this series. In dealing with the large number of subjects which conditions of warfare

²R. Pemberton, B. M. Hendrix and C. Y. Crouter in collaboration with R. B. Osgood.

produce, it is important that the therapeutic measures employed admit of application on a large scale and in a wholesale manner. It is therefore a cause of congratulation that means partaking more or less of this nature exist, but, unfortunately, a large number of subjects which could not be successfully treated in this way still remained to be accounted for. Reference will be made later to the treatment of this group.

Every effort was made during the course of the studies at General Hospital No. 9 to provide a thorough analysis of each case in regard to focal infections, but it is clear in retrospect that, in spite of painstaking and skillful cooperation from many directions, the inherent nature of the problem left something to be desired. Certain regions, such as the accessory sinuses of the skull, apparently play a larger rôle and offer more difficulties in recognition than is generally appreciated. Experience in civil life has demonstrated that there is room for a great variety of opinions among specialists in any given field, such as the nose and throat, and the experience of an examiner, however sound and extensive, may not necessarily qualify him to detect and weigh the factors making for focal infection in arthritis. The detection and evaluation of focal infection constitute a field in which an intensive experience must generally be developed, and for this reason it would be difficult for the medical department of any army in time of war to provide the number of highly trained specialists necessary for accurate analysis of this kind.

In the event of another emergency, however, comparable to the recent one, it is plain that wider and more thorough provision must be made from the standpoint now under discussion, and a large group of examiners qualified and trained in these lines would form an indispensable link in any adequate chain of preparations to meet this disease.

Another of the outstanding lessons from the studies above referred to relates to the benefits derived from catering to the lowered metabolic functions which have been shown to accompany arthritis more or less closely. This has particular value in selected refractory cases which yield to no other measures. Some cases, for example, will recover entirely by a curtailment in their caloric intake, while in others not responding so well to these measures alone the way may nevertheless be paved by such means for benefit through hydrotherapy or medication that would otherwise be unavailing. In any therapeutic attempts on a large scale there would be required a number of dietitians and facilities for caloric feeding. This is a recognized necessity in the treatment of diabetes, but is more difficult of conduction in arthritis because of the great number of cases, more than ten to one, as compared with diabetes. It is probably fair to say that the dietetic regulations

in force at many of the present centers and sanatoria for the treatment of arthritis need revision along lines of modern conceptions of the disease. The idea is still generally current, for example, that "red meats" and fruit are inimical to arthritis, whereas it is pretty clearly demonstrated that part of the under-nutrition of some cases results from needlessly withholding a varied meat dietary. There may be, to be sure, some benefit in withholding "red meats," but this results chiefly from the incidental lowering of the caloric total and not from any specific harmful influence of the red meats *per se*.

It is probably entirely safe to say that the major rôle for evil in diet is played by the carbohydrates which furnish most of the caloric requirements under ordinary conditions of life. The question is doubtless one of bacterial and of digestive fragmentation in the intestine on the one hand, and of oxidation and combustion in the tissues on the other, in which all foodstuffs share, but the greater use and availability of the carbohydrates make them the chief offenders. It is probable, then, that many dietetic schedules in the treatment of this disease should be revised both in the proportion of the various kinds of foods on the one hand and in the total caloric yield on the other.

It was the intention of the writer, had the emergency created by the war continued, to establish a series of dietaries which could be assigned to selected groups of cases in a more or less routine way. This principle of low caloric feeding is followed uncritically and even unwittingly at some of the "Kurots" of Europe, where the benefits may be very real but are often negated by the under-nutrition and depletion resulting.

It would probably never be possible to apply dietetic procedures in the treatment of arthritis in the Army in a wholesale way except as regards minor dietary restrictions. These could doubtless be safely and profitably carried out, but more severe degrees of curtailment involving nutritive problems would require the same individual attention that must be given diabetics, and each such case of arthritis would become a problem by itself.

Another accessory department of medicine which needs emphasis in connection with arthritis and would certainly require larger representation under war conditions is that of orthopedic surgery. One clear-cut impression from study of the above 400 cases relates to the importance of orthopedic analysis, as many of the cases presented problems with which the internist alone is unable to cope. The varying types and degrees of back strain, the faulty statics in the crippled, and the necessity for correction of contracted limbs and the like call for a large degree of assistance.

It is also doubtless true that many cases of arthritis have been in actuality precipitated by strains or static disabilities within the sphere of the orthopedist, and in preparing again for a large effort along these lines the writer would lay increased emphasis in this direction. Orthopedists have had a large part of the burden of caring for arthritis thrown upon them in the past by the indifference of their medical confreres, and, through the necessity of treating the sequellae of arthritis, have gone afield to consider the basic nature of it. They have done this with great credit to their branch of the profession, but the problem of arthritis belongs, nevertheless, within the domain of internal medicine and the laboratory. It should be necessary to appeal to orthopedists only for the sequellae of the disease, for such mechanical errors as predispose towards it and for the prevention of deformities from the assumption of malposture.

It is common knowledge among orthopedists that much of the deformity and faulty position in arthritis is preventable and is due to neglect at the time of acute exacerbations, when a position of greatest comfort is assumed and maintained over a long period of time. Practitioners and internists as a whole often fail to appreciate this vital point, as the writer can testify from scores of cases in which remediable arthritis has been complicated by a sometime preventable deformity that has reached the permanent stage. These considerations should apply not only to limbs and joints but also to malposition of the body as a whole, whether in bed or out. The importance of avoiding the unnecessary handicaps consequent upon the slouched positions of most chronic invalids is very great, but in arthritis the matter becomes one of the important factors in treatment. Internists are poorly equipped to cover this wide field and, as attention to it originated with the orthopedists, they should supervise this phase of the arthritic problem. Under either civil or military conditions the physician who allows deformity to arise in arthritis without conscious effort to avoid it from the outset is guilty of injustice to the patient.

On the surface, arthritis is proverbially a dry subject to most physicians, and the best results in the care of large numbers of cases would be achieved only by careful selection of the medical officers assigned to such work. Perhaps nothing is more fatal to the successful treatment of arthritis than an unthinking attitude and an indifferent routine toward the patient. These may arise very easily and are not unfamiliar on the part of many who are well intentioned but do not appreciate the broader problems involved. There are, furthermore, few diseases which impinge upon more or wider domains of medicine, but interest in these various factors is dependent largely on an inquiring outlook—

a consideration which should be critically borne in mind in selecting personnel.

Some emphasis can be placed here upon certain conclusions arrived at for the prevention of arthritis in the Army during war conditions, because the principle involved applies also to times of peace. These conclusions were in part as follows:

1. Chronic arthritis is one of the larger medical problems affecting the soldier in service. Soldiers developing it have had previous attacks with a frequency about five times greater than have soldiers admitted to hospital for other conditions at large.

2. Exposure was the exciting factor in 58 per cent of 400 cases studied. Critical examination of all patients revealed apparent foci of infection in 72 per cent. Although the etiologic importance of focal infection, especially in civil life, is not to be minimized, it is clear that the present group showed a considerable independence of it. One hundred and eighty-four patients, or 46 per cent, recovered in the presence of demonstrable surgical foci. This nearly three times the number which improved (sixty-five cases, or 16.25 per cent) after the removal of foci. The tonsils were most frequently the site of infection (52 per cent); the teeth were next (33.5 per cent); the genito-urinary tract came last (12.5 per cent) and clearly played an almost negligible rôle in causing arthritis.

3. Critical examinations of recruits for a history of previous attacks of arthritis would reveal cases most likely to develop it. It is reasonable to believe that rejection of this group, or at least the worst cases in it, would importantly reduce the incidence of arthritis in the Army. A more conservative policy would segregate such cases, examine them for foci of infection, and remove such foci when found. This would have the added importance of prophylaxis towards the civil community. These measures could be combined by applying one or the other appropriately.

It is obvious that considerations which bear on the difficulty of analysis for focal infection under war conditions apply analogously in times of peace and that a more thorough analysis of the recruit at the hands of those who have had opportunity to develop intensive experience along these lines in their specialities would go far towards reducing the incidence of rheumatoid conditions at the present time.

It is perhaps pertinent to point out that, in attempting the care of arthritides, a broad medical viewpoint is very important, though this becomes even more so in civil life where the greater age of the subjects introduces the complications incidental to chronicity and advancing years.

The large difficulties encountered in the effort to study and treat

arthritis on the scale necessitated during the war have borne in upon the writer the importance, in the event of another emergency, of being prepared to take up this problem earlier and in a larger way. The element of chronicity plays such a large rôle that it seems of the highest importance to avoid the delay of six or nine months to which many cases were subjected before even elementary steps were taken to relieve the situation. The necessary combination of physical equipment and accurately trained medical personnel is not to be found in hospitals at large, whether in civil life or under army conditions, and the writer is of the opinion that at least a skeleton plan of procedure should be in readiness. Those institutions which are strong in equipment and physical facilities are generally devoted to wholesale measures lacking critical medical direction, and where the highly trained viewpoint from physicians and surgeons is available, accessory physical measures are too often deficient or absent.

The proper location of an institution for the treatment of arthritis is also of importance. This is sometimes conditioned by the availability of medicinal springs, etc., but in general a more important consideration is climate. Hydrotherapy of various kinds can be at least closely simulated anywhere if adequate effort be made, but climate may impose limitations from which there is no escape. Even the sandy and relatively dry region in which General Hospital No. 9 is situated, at Lakewood, N. J., was found to have disadvantages during perhaps five months of the year, possibly because of proximity to the sea and low altitude. It is probable that a reasonable elevation above sea level in a mild, dry climate constitutes a desideratum in this connection.

It is easy to mistake the relative importance of medical conditions which present a striking but fleeting picture, and that of more chronic conditions like arthritis, whose onset may be insidious but whose consequences may be visited during the whole subsequent life of the subjects upon society at large. The importance of arthritis as an age-long disease and one of the most widely distributed of social problems is far from appreciated, although there are many signs pointing to increasing realization of it. It may not be out of place to mention here the fact, probably unknown to most persons, that in England, before the war the Committee for the Study of Special Diseases, with headquarters at Cambridge,³ selected arthritis after a careful survey as the problem most needing solution, and at the outbreak of the war a very serious and large effort towards its solution had already been under way for several years. The results anticipated were unfortunately postponed by the

³Bulletin of the Committee for the Study of Special Diseases. Edited by T. S. P. Strangeways. Vols. I and II, 1903-8, *et seq.* Cambridge University Press.

war, but it is well known that the preparations in England for the care of sufferers from arthritic and joint conditions in general were very large and probably relatively greater than those made by the United States.

Summarizing, the conclusion can be justifiably emphasized, as revealed by observation and study in the United States forces, that arthritis presents a problem of military and social importance not hitherto appreciated. In view of the considerable data bearing upon this problem, failure to anticipate and provide for it in the event of another emergency would result in a largely avoidable and important reduction of military strength. A further result would be a long-continued after burden upon the civil community, to say nothing of the element of personal suffering entailed.

It is suggested that the available data would form the basis of a skeleton plan of organization directed towards prevention of the disease, treatment of it and investigation of its nature. Consideration of treatment should include centers for this purpose, their location, equipment and personnel; and investigative effort should be on a scale commensurate with the increasing necessity for solving this problem and the unusual opportunities to this end created by war conditions.



A NEW PHILIPPINE MOSQUITO

(*Diptera, Culicidae*)

By C. S. LUDLOW

Army Medical Museum

AMONG the mosquitoes sent to the museum during the summer of 1921 is an apparently new *Stegomyia* taken at Fort Wm. McKinley, which somewhat resembles the lately described *Stegomyia christianus* Dyar from China and the Philippines, but shows definite points of difference.

Stegomyia punctifemore n. sp. Ludlow.

Female: Head very dark brown, practically black, covered with black and white flat scales, and a few black fork scales near the nape. There is a median stripe of black scales tipped at the very point of the vertex with a few white scales, followed laterally on either side by a stripe of white scales and then a stripe of black scales, and this followed by another and narrower white stripe and then black scales. All of these stripes are irregular, having indented edges, so that the appearance is very ornate. The proboscis is rather short, mostly ochraceous scaled; a dark, narrow line on the dorsal aspect, and the more apical part and labellae dark. The palpi are short, dark scaled with a thick tuft of light (ochraceous) hairs on the apex, heavy enough to give the appearance of a light tip. Antennae, verticels scanty, brown, as is the pubescence; basal joint brown, darker on the median portion where there are a few white flat scales. Eyes brown. Clypeus brown, pruinose.

Thorax: Prothoracic lobes, widely separated, black, with a few white flat scales and dark bristles. Mesothorax, very dark, practically black, covered with black curved scales, having a bronzy reflection, and white, mostly flat but a few curved scales. There are two sub-median white spots at the very nape and some scattering white scales on the shoulder angles; a little caudad and a little laterad of these two white spots are two well-marked, round, white spots, and still further caudad, but in a cephalo-caudad line are two more round white spots. These four brilliant white spots at once catch the eye, while those at the nape are not perhaps at once noticed. There are also some scattering white scales around the "bare space," and a small group cephalad of the wing joint. All these white scales are flat, except the few scattered ones on or near the median line, cephalad to the "bare space." There are a few dark bristles on the lateral margins and at the wing joint. Pleura dark with bunches of white scales, and dark bristles. Scutellum dark brown, apparently partly denuded with some white flat and a few brown flat scales on each of the lobes, but the intermediated spaces naked. Six bristles on the mid and four on the lateral lobes. Metanotum brown, pruinose.

Abdomen: Partly denuded, brown, but paler than the mesothorax,

covered with thin light brown, transparent scales, and light border and lateral bristles. There is a narrow lighter (i. e., lighter brown) basal band on the fourth segment, but this is not always apparent in some lights; large, basal, lateral spots on all but the seventh segment; the venter is mostly hidden, but the terminal segments are brown; the cerci are exerted.

Legs: Coxae like pleura, trochanters light. All the femora are dark sealed with a marked sprinkling of white scales on the dorsal aspect and a small white apical spot; ventrally they are light, rather a sordid white, nearly to the apex, with a brown portion just preceding the apical white spot. Tibiae of fore-leg speckled like femora, a white spot just interior to the apex, the very apex brown. Tibiae of mid and hind legs much as femora, the apical spot not so large; there are occasional white scales on the first and second mid tarsals, otherwise the legs are a dark brown. Fore unguis dark, uniserrated. The fore leg is detached, but intact, and the mid and hind legs have lost some of their tarsal joints, all after the second on the mid legs, and the fifth on the hind legs.

Wing: Fuscous with brown scales, except at the base of the costa where there is a small white spot. The scales on the sub-costa and stems of the second and fourth veins resemble "taeniorhynchus" scales, but on the remainder of the wing they are ligulate or even linear. The cells are short compared to the length of the wing, but are nearly the length of their petioles. The cross veins meet the long veins at right angles; the posterior not more than one-third the length of the mid-cross vein, and at least three times its own length interior. Halteres with light stem, and the knob heavily brown scaled.

Length: about 5 mm. without proboscis; wing 4 mm.

Habitat: Fort Wm. McKinley, Rizal, P. I.

Taken: August 20, 1921.

Described from one female, imperfect as shown in the description, but the important points are covered so that there should be no difficulty in recognizing the species.

The white, flat scales on the mesonotum would place this species in Theobald's *Kingia*, but in the classification at present recognized the species is thrown into *Stegomyia*.



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*Published monthly and constituting two volumes annually
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"THE INSOLENT OF OFFICERS"

"The insolence of officers," that good old demagogic phrase which probably has been used to make capital with the helpless proletariat since the days of the myrmidons and the Centurions. There is no cause so strong as that of the under dog, and even the assumption that a certain class occupies this nether position will bring certain sympathy for it and by no means uncertain scathing invective against the "gilded satraps" to quote a phrase once made famous by a prominent politician nationally known by the color of his whiskers who are the party of the second part, the overbearing overlords of this supposed submerged tenth.

This undesirable characteristic of the "officer" creeps often into print, and there is little doubt that it carries conviction to many honest voters of our country who are compelled, perforce, to base their deductions on what appears in the press rather than on the surer foundation of actual contact with the oppressor and the oppressed during the working days of enlistment and commission when the "insolence" is supposed to be very much in evidence.

Just as we all have an inherited dislike for the serpent, bred in us for untold generations, so it would sometimes seem there is an instinctive distrust as to the integrity and humanity of those of the armed forces who happen to bear the mark of responsibility on their shoulders. There are several understandable reasons for this. Perhaps the most cogent one is that unfortunate lack of understanding which has very generally existed between the man of arms and his civilian brother. The fault for this lies at the door of either, and it is sadly true, both that one is clannish, and the other ignorant of true conditions, and also very

indifferent as to his enlightenment. Since our recent difference of opinion with our late enemies, there has come, in a measure, some amelioration of both these attitudes; but, alas, enough still remains of both to yet give ground for umbrage on one side and misapprehension on the other. Another reason is that, unfortunately, in isolated instances there is support for the accusation. Not all men are saints, and the mantle of virtue fails to cloak all officers in perhaps the same percentage that it fails to make all enlisted men models of deportment. It is fair to neither class, however, to judge the great majority by the regrettable but few exceptions. Another cause of this distrust of those in command may be statements made by those who have failed to measure up to the standard set for them and who, with the instinct of self-defense, are quite prompt to shift the blame for their own shortcomings on other shoulders. These reports are "good copy" and therefore find space, as do many other loose statements, in our daily papers, and unfortunately, credence with no inconsiderable part of the public which reads them. This same public does not seem to reflect that while these charges represent the opinion—honest, let us predicate—of a certain quota of the armed forces, there is still to be heard from the silent majority of enlisted men who have years of faithful and honorable service behind them and have found no necessity during that time to take exception to the "insolence" of those under whose command they served. And so, here we have public opinion molded, to a large extent, by the report of a minority committee, which is neither logical nor in keeping with the usages of parliamentary practice. No individual, no class, should be convicted on the basis of evidence solely from the standpoint of the prosecution.

Is it a fact, we wonder, that those who accept "the insolence of officers" as incontrovertibly true have any definite and clear-cut ideas as to actual relations between the enlisted man and his officer, under the oath of allegiance, army regulations and the unwritten customs of the service which prescribe exactly the metes and bounds within which each one shall move and act?

The "insolence" of any officer would defeat the end at which he aims—the making of an efficient, satisfied, contented unit, whether it be a company, battalion or regiment. This is no matter of mere theory but is very clearly demonstrated by Col. E. L. Munson in his recent book on *Morale*. It could not persist under inspection by those higher in command and would inevitably lead to the relief of the "insolent" officer as not fitted for the command of troops. If we allow, as seems just and proper, that the average officer is anxious, both for the sake of his own reputation and the good name of his service, to have under

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ASSOCIATION NOTES

At a meeting of the Executive Council of The Association of Military Surgeons, November 4, 1921, the following names were proposed and elected to membership in the Association:

Medienl Corps, U. S. Navy

Captain

Granville Louis Angeny

Medical Corps, U. S. N. R. F.

Lieutenant

Elmer Clinton Texter

Medical Corps, U. S. Army

Major

George P. Sackrider

Captains

Gustave W. Dishong

William S. Dow

Alva Garfield Dunbar

Frank A. Swezey

Harry Allen Van Osdol

Medical Reserve Corps, U. S. Army

Major

Joseph H. Stolper

Captain

James Broomfield Clinton

First Lieutenant

Pedro Juan Zamora

United States Public Health Service

Surgeons

Owen S. Deathridge

Oswald Evans Denney

Edward Alfred Everett

Zachariah Garton Jones

Herman Joseph Kaufler

Leon L. Solomon

Passed Assistant Surgeon

Marcus H. Watters

Assistant Surgeons

Paul Richard Copeland

Harry Alton Schachter

Acting Assistant Surgeons

Eugene S. Clark

William Frederick Dager

Owen Breekinridge Demaree

James Mitchell Doughty

Charles Harold McEnerney

Charles H. Merritt

Joseph P. Mulhern

Charles William Naulty, Jr.

Henri Louis Pache

Hunter Ledbetter Scales

Charles E. Sexton

H. Preston Sights

Jerome Hill Titus

Ellsworth Haydn Trowbridge

Harrison W. Wright

Attending Specialists

George Huston Bell

Franklin D. Garrett

James Ellery Reeder

Edgar Stanley Weimer

William E. Wright

Associate Members

Capt., Medical Adm. Corps, U. S. A.

Milton H. Epstein

Acting Asst. Dental Surgeon, U.S.P.H.S.

James H. Poston

COMMENT AND CRITICISM

DISPERSION OF FLIES BY FLIGHT¹

The following review of investigations carried out recently relative to dispersion of flies by flight has been prepared by Maj. A. N. Tasker, Medical Corps, and is published for the information of medical officers generally:

It has long been recognized by sanitarians that a greater knowledge of the methods by which disease-bearing or otherwise injurious flies are disseminated and of the limits of such dissemination would be of extreme value in the application of measures designed to prevent the incidence and development of epidemics of diseases transmitted by these means, but only within the last few years has any detailed effort been applied to the problem of securing this particular epidemiological information. Although some experiments had been previously carried out, it was not until a series of investigations made by Bishopp and Laake of the Bureau of Entomology, United States Department of Agriculture, in 1916 that any definite proof was had that flies ever traveled by natural dispersion more than a comparatively short distance (one or two miles) from the place of original egg deposit during the course of their adult life.

Briefly, the course of procedure employed in their studies by the entomologists above-named was to catch several thousand flies in a trap, mark them so that they might be distinguished, liberate them, and later identify them by their markings after they had been caught in other traps placed at varying distances from the point of liberation. Although several different species were used in these experiments, a very large majority of the individuals were either *Musca domestica*, *Chrysomya macellaria*, or *Phormia regina*. Including a preliminary experiment, five separate tests were performed in Texas in the summer of 1916. The total number of marked flies used during the course of the whole investigation was estimated at 234,000. Large conical fly traps were baited with "gut slime," a packing-house by-product. When a sufficient number of flies had been trapped, a screen cylinder was placed above the fly trap, the cover of the trap was removed, and the flies were disturbed so that they would pass up into the cylinder. When several thousand had thus made their way out of the trap, the lower end of the cylinder was closed by a piece of cheese cloth and the cylinder with its contained flies was placed in a canvas bag. The flies were at once taken to the point of liberation previously determined upon, and at this point finely powdered red chalk or paint pigment (an ounce or two) was introduced into the cage which was then inverted several times. The top of the cage was next removed and the flies allowed to escape. Upon emerging from the cage, the flies were all seen to be distinctly covered with the coloring agent employed, a majority of them being brilliant red. In every experiment there was a considerable mortality among

¹ Reprinted from *Medico-Military Review*, Office of the Surgeon General of the Army, vol. v, No. 8, October 15, 1921.

the flies that had been lured into the cages, but Bishopp and Laake express the opinion that this was due more to the heat to which the insects were exposed during the time of transportation from the point of capture to the point of liberation than to any injurious effects of the coloring matter used. That several marked specimens were recovered as long as seventeen days after liberation still showing the presence of the coloring agent on their bodies would seem to indicate that this could not have been essentially deleterious in its effect upon the flies.

In order to determine the distance of dispersion, several conical traps 18 inches in diameter and baited with the same "gut slime" were distributed at varying distances from the point of liberation about the country-side. The flies caught in these recovery traps were killed at intervals of twenty-four hours, and the masses of insects therein were carefully gone over for marked specimens. In a great majority of instances such specimens could be identified with the naked eye, but in cases of doubt the individual was subjected to examination with a microscope. It was found that for the first few days after liberation most of the flies remained intensely colored, but as time passed the insects managed to rid themselves of the pigment until at the end of several days little or none could be found except upon the halteres.

Bishopp and Laake summarize the results of their experiments and the conclusions which they draw from them in the *Journal of Agricultural Research* for August, 1921.

1. In the territory over which these experiments were conducted both urban and rural conditions were encountered. Under conditions of both kinds there was proof that flies have marked powers of migration.

2. The maximum distance of spread from the point of liberation for *Musca domestica* was found to be 13.14 miles; for *Chrysomya macellaria*, 15.1 miles, and for *Phormia regina* 10.9 miles. While other species were included among the flies liberated, the individuals belonging to them were too few in number to give any reliable data as to their dissemination tendencies.

3. *Chrysomya macellaria* evinces a stronger migratory instinct than does *Musca domestica*. *Phormia regina* showed itself equal to *Chrysomya macellaria* from this point of view in one test which offered optimum climatic conditions for the species.

4. Among the stimuli which induced dispersion, the desire for food and to find a place in which eggs might be deposited appear to be among the strongest; but, on the other hand, the fact that in many instances individuals of the three species mentioned above were found to have passed by not only farm houses but even towns and cities which would furnish highly favorable facilities both for feeding and breeding indicates that these insects are not influenced by these factors alone, but are in addition characterized by a real migratory tendency.

5. The exact influence exerted by currents of air upon the direction and amount of dispersion could not be determined with accuracy during the course of these experiments because of the "choppy" wind conditions experienced. No more can be said than that there seems to be a tendency for flies to travel with the wind in somewhat increased numbers. They have, however, been shown to travel against the wind and

at right angles with it. The investigators conclude, therefore, that the influence of moderate winds on insect dissemination is not of prime importance.

6. Sex is not a dominant factor in the matter of fly dissemination. Males, as well as females, of the three species named, may travel many miles; but there does seem to be some tendency for females in greater numbers to travel far than is the case with males.

7. The maximum length of life of marked specimens after the day of liberation as indicated by records of capture was for *Musca domestica* fifteen days, for *Chrysomya macellaria* seventeen days, and for *Phormia regina* ten to eleven days.

8. Without stating the basis for their belief, the authors of the article under abstraction nevertheless advance the opinion that these experiments by no means indicate the extreme possible limits of fly dispersion, and they apparently expect future investigation to show that under conditions which favor the production of great numbers of flies the extreme limits of flight will be found to be much greater than the maximum as determined by them.

The information here presented is of much importance to the camp sanitarian. It teaches in the first place that he and the camp commander cannot be held responsible for the numbers of flies present within the camp limits to as great an extent as was considered to be the case when it was thought that flies were produced, lived, and died within very restricted areas having a radius of not more than a mile or two. It indicates also that the possible source of infection from which fly-borne diseases may be brought to a camp or post by these insects are much more numerous (because more widely distributed) than was formerly held to be true, and it therefore emphasizes the necessity of an active campaign which shall continue throughout the fly season looking to the destruction of adult flies as well as to the most complete suppression possible of all those factors which may serve to attract these insects. Finally, it indicates the great necessity for a much closer cooperation in effort between all sanitary authorities—national, state, municipal, and military—to the end that the breeding of flies may be reduced or eliminated so far as may be possible.

INTERESTING STATISTICS¹

The figures presented in the following table are of interest to medical officers as indicating the distribution of man power in the different branches of the Army, Navy and Marine Corps and the comparison of the number thus distributed with number of men registered but not inducted into service.

¹ Reprinted from Medico-Military Review, Office of the Surgeon General of the Army, vol. v, No. 8, October 15, 1921.

MAN POWER—UNITED STATES—DISTRIBUTION, NOVEMBER 11, 1918—APPROXIMATE

	Number	Per cent of total
Registered and not called.....	20,500,000	82.7
Army.....	3,670,888	14.8
Navy.....	538,194	2.2
Marine Corps.....	72,920	0.3
Total.....	24,782,002	100.0

ARMY

	Commiss- ioned	Enlisted	Aggregate	Per cent of total
In A. E. F.....	80,842	1,868,474	1,949,316	53.2
In United States.....	104,155	1,530,344	1,634,499	44.5
Others*.....	3,437	83,636	87,073	2.3
Total.....	188,434	3,482,454	3,670,888	100.0

NAVY

Regulars.....	10,489	172,000	182,489	33.9
Reserves.....	20,705	290,000	310,705	57.7
Draftees.....		45,000	45,000	8.4
Total.....	31,194	507,000	538,194	100.0

MARINE CORPS

In United States.....	1,029	36,004	37,033	50.8
In A. E. F.....	857	23,698	24,555	33.7
Others.....	545	10,387	11,332	15.5
Total.....	2,431†	70,489	72,920	100.0

* Included 1,162 commissioned and 21,072 enlisted at sea, 1,977 commissioned and 58,753 enlisted in insular possessions, etc., and 298 commissioned and 8,806 enlisted in American Expeditionary Forces in Siberia.

† Includes 287 warrant officers.

RED CROSS MEDICAL SUPPLIES AID RUSSIANS

Medical supplies contributed by the American Red Cross and distributed by the American Relief Administration are being shipped into Soviet Russia in increasingly large quantities. By the end of the year Red Cross supplies valued at more than \$1,750,000 will have been placed at the disposal of the American Relief Administration for use in the disease-ravaged provinces.

These supplies include drugs, hospital supplies and equipment and hospital clothing from Red Cross stocks in Europe and in the United States. Medical effort will be centered in the Provinces of Kazan, Simbirsk, Samara, Saratov, and to a limited extent in Petrograd and Moscow.

Dr. Henry Beuwkes, who is directing the distribution of the Red Cross medical supplies, says in a recent report to National Headquarters:

The cholera epidemics have been relieved and the disease is now sporadic.

Typhus fever is appearing and severe and extensive epidemics are expected this winter.

Malaria has been severe and is still prevalent in chronic form.

Typhoid fever and scorbutus are very prevalent as well as infectious exanthemata, and diseases of the skin and eyes.

Constitutional diseases are severe and widespread.

Drugs and hospital supplies are extremely scarce and satisfactory medical and surgical work is in consequence impossible. A leading surgeon in Simbirsk said they draw thread from clothing to secure suture material. Hospitals are congested and have long waiting lists.

Our present plans contemplate the supplying of existing hospitals and clinics with drugs and hospital supplies essential to their operation, the organization of clinics at food distributing centers in areas without medical facilities, and the inauguration of measures to prevent and combat diseases in areas in which we operate.

In order to combat typhus we have in view the establishment of large numbers of bath and disinfecting units to be installed and controlled by American personnel and operated by the Russians. Installations will be simple and the cost low in comparison with the benefits rendered in areas badly infested and without bathing facilities.

U. S. TRAINING SCHOOL FOR NURSES

A training school for nurses of the U. S. Public Health Service is to be established by the Surgeon General which will offer to women desiring to take up the profession of nursing a course of study leading to a diploma and an opportunity to assist in caring for disabled military patients.

The headquarters of the school is in the office of the Surgeon General, Washington, D. C. Training will be given in certain hospitals in the service. Schools will open on September 1 at Fort McHenry in Baltimore and at Fox Hills, Staten Island, N. Y. The service hospitals provide experience in surgical nursing, including orthopedic, eye, nose,

and throat; medical, including communicable, nervous, and mental diseases; X-ray and laboratory technique; experience in the diseases of children, and public health nursing. Gynecology and obstetrics will be provided in the second or third year of the course through affiliation with civilian hospitals. Lectures, recitations, and laboratory work will be given in the required subjects in each hospital training school.

The course will be three years. A credit of nine months, or approximately an academic year, will be given to graduates of accredited colleges. Credit of three or more months will be given to students who have had two or more years in college or in approved technical schools that include the prescribed courses in the sciences. The three years will be divided into a probationary term of four months, a junior year of eight months, and an intermediate and senior year of twelve months each. Vacations of one month each year will be granted. Hours of duty in the ward will be arranged with reference to the requirements of the class work. Throughout the probationary first four months they will not exceed six hours daily, and eight hours thereafter.

Candidates should make application, in person or writing, to the Surgeon General, U. S. Public Health Service, Washington, D. C. Special consideration will be given to candidates who have taken the course in Elementary Hygiene and Home Care of the Sick with the Red Cross or who served as nurses and aides in army or civilian hospitals throughout the war. Candidates must be between 21 and 35 years of age, must pass a satisfactory physical examination, and must be graduates of a recognized high school or present evidence of an educational equivalent.

No tuition fee will be required. Students will be provided with quarters, subsistence, laundry, and text-books through the course. They must provide their own uniforms. A monthly allowance of thirty dollars for the first two years and fifty dollars for the third year to meet these and other school expenses will be made. Reasonable medical treatment will be supplied.

Connection between the student and the school may be severed by either side at any time during the period of training. Students who complete the prescribed course and pass physical examination become members of the regular U. S. Public Health Service Nurse Corps. All students except those to whom credit for collegiate or technical work has been given will be eligible for registration in any state except those requiring three full years in a hospital. They will also be eligible for membership in the American Nurse Association and other organizations, for enrollment in the nursing service of the American Red Cross, and for post-graduate courses in the teaching, administrative, and public health fields.

BOOK REVIEWS

THERAPEUTICS, MATERIA MEDICA AND PHARMACY, by Samuel O. L. Potter, A. M., M.D., M.R.C.P. London; formerly Professor of the Principles and Practice of Medicine in the Cooper Medical College of San Francisco; late Major and Surgeon of Volunteers, U. S. Army. Revised by Elmer Funk, M.D., Associate in Medicine, Jefferson Medical College, Philadelphia; Medical Director and Physician in Charge of the Department for the Diseases of the Chest of the Jefferson Hospital; Fellow of the College of Physicians of Philadelphia. Thirteenth edition, 8vo xv+960 pp. Cloth, \$8.50. Philadelphia, P. Blakiston's Son & Co.

This well-known book, now in its thirteenth edition, maintains the high standard of excellence of the earlier editions. The section in materia medica has been brought up to date and made to conform to the Ninth Revision of the United States Pharmacopoeia.

The subject matter in general has been revised and enlarged to include advances in the field of therapeutics. Especially to be noted is the section on therapeutics, which has been brought up to date to include the Allen treatment of diabetes, the serum therapy of pneumonia, the Swift Ellis treatment of neurosyphilis, the paraffin treatment of burns and the newer methods of treating bichloride of mercury poisoning. In addition, there is a new chapter on Electrotherapeutics, which summarizes our knowledge on that subject.

A section that will be of value to the medical student as well as to the physician is the one devoted to pharmacy; particularly so is the part describing prescription writing. There are sections on incompatibilities, poisoning, urine analysis, table of differential diagnosis, solutions, weights and measures, etc.

The high standard of excellence set by the earlier editions is maintained in the present one. The book fills a want and should find its place in the library of every practitioner.

L. A. NEWFIELD, M. D.

MORRIS'S HUMAN ANATOMY. A complete systematic treatise by English and American authors. Edited by C. M. Jackson, M. S., M. D., Professor and Director of the Department of Anatomy, University of Minnesota. 1,164 illustrations, 515 printed in colors. Sixth edition, revised and largely rewritten. Philadelphia: P. Blakiston's Son & Co. Price, \$10.

To the older men who learned their anatomy from the classical pages of Gray or some other work which lacked the attractive appearance of modern books on this subject, it must seem that the student of today should have relatively little difficulty in mastering this important part of a medical education. In the matter of illustration alone the difference between the unrelieved monotony of line cuts as illustrations and those in a work of this character seem to give to the modern student an advantage not possessed by his antecedents of two decades ago.

In this sixth edition of Morris's Human Anatomy the excellent features of the former editions have been preserved and others added. In this last issue, the more salient and important truths are printed in ten-point type, while those which are dependent on them are in smaller letters. This enables the beginning student to realize at once what is of paramount importance to him and what depends on the mastery of this.

Some changes which may be noted are: The section previously entitled Mor-

phogenesis is now headed Developmental Anatomy, and has been rewritten so as to include both prenatal and postnatal changes. The skin and mammary gland have been separated from the glands of internal secretion and the spleen is taken up under the lymphatic system. The Anglicised form of the BNA has been continued as to nomenclature, following out the procedure adopted in the fourth edition of this work.

The work is divided into fourteen sections as follows: Developmental Anatomy, Skin and Mammary Glands, Osteology, The Articulations, The Musculature, Blood-vascular System, The Lymphatic System, The Nervous System, Special Sense Organs, The Digestive System, The Respiratory System, The Urogenital System, Glands of Internal Secretion, Clinical and Topographical Anatomy and preceded by an introduction by Dr. Jackson, the editor of the work. The chapters are written by men who are able to speak "ex cathedra." The illustrations are numerous, are beautifully done and add much to the clearness of the text. The work is thoroughly indexed. There seems to be every reason why this edition should meet with as much favor as the previous ones and every reason to suppose that it will in its up-to-date dress be more helpful to those who undertake the study of anatomy.

MICROBIOLOGY. *A Text-book of Microorganisms General and Applied.* Edited by Charles E. Marshall. Third edition, 200 illustrations, 1,054 pp. Philadelphia: P. Blakiston's Son & Co., 1921. Price, \$4.

This is the third edition of a justly popular work upon microorganisms which contains much useful information not to be found in any other of our text-books upon bacteriology or parasitology. The subject is not approached from the standpoint of the physician and, while this is true, the book is still of the greatest service to the medical bacteriologist and practitioner in that it contains exhaustive chapters upon phases of bacteriology not usually treated in our medical text-books.

The volume is written by twenty-five different authorities upon the subjects of which they treat, so that in effect it is a collection of essays, all of which are so excellent that it is difficult to estimate which are the more valuable. The chapters upon morphology and culture, by Guilliermond, and upon the physiology of microorganisms, by Rahn, are very comprehensive and contain a great deal of material which one does not find in medical text-books upon these subjects. The microbiology of air, by Buchanan; the microbiology of water and sewage, by Harrison; the microbiology of soil, by Lipman; and the microbiology of milk and milk products by Stocking and Hastings, are very complete considerations of the subjects treated while the chapters by MacNeal upon the preservation of food by cold and microbial food poisoning are most excellent.

The work is essentially one devoted to the microorganisms concerned in agriculture and domestic science, and therefore the microorganisms concerned in the etiology of specific infections are not considered in the detailed manner that they are in medical works upon bacteriology and parasitology. However, the consideration given disease-producing microorganisms in the volume is adequate when one remembers the purpose of the work, and the information supplied is accurate and well selected. All in all, the book is one that can be cordially recommended to students in agricultural colleges and to those who desire a broad acquaintance with microbiology. It will also prove useful as a reference work for the medical bacteriologist and parasitologist who will find in it much material difficult to obtain elsewhere.

The book is well printed and bound, and the price, unlike that of most scientific works now published, is very reasonable.

CHAS. F. CRAIG.

GENERAL PATHOLOGY. An Introduction to the Study of Medicine. By Horst Oertel, Professor of Pathology, McGill University. 357 pp. Cloth, price \$5. New York: Paul B. Hoeber.

The reviewer has read with pleasure and profit this book of Oertel's upon general pathology, for while it lacks completeness in the consideration of certain important subjects it does approach the subject from a different angle than that followed by other writers, and contains much of value that does not appear in some of the larger text-books upon pathology.

In his preface the author states that his purpose is "to convey to my readers that pathology must be approached within the frame of modern biology, and that in the study of disease, no less than in the study of health, scientific vision is possible only if we divest ourselves of all metaphysical and teleological conceptions of use, harm, defense, vital forces, conscious purpose, etc., and treat pathological processes entirely as expressions of physicochemical laws," and a careful reading of the work proves that his endeavor in this respect is fulfilled. His discussion of heredity and disposition and immunity are scholarly and contain much food for thought, while the chapters upon pathological changes in cells, changes in local cell reactions and changes in general cell interrelations are well written and scientific presentations of basic facts in pathology. Throughout the work the author has included the historical development of each subject treated, and these historical references are not the least valuable portions of the book.

The treatment of the specific bacterial causes of disease cannot be said to be adequate in many instances. For instance, the plague bacillus is dismissed in a little over one page of descriptive matter, the pneumococcus in a scant three pages; the paratyphoid bacilli in little more than one page, while in hardly a single instance is adequate treatment accorded any of the specific bacteria concerned in the etiology of infection. The entire subject of the pathogenic protozoa is covered in four pages, only four protozoan parasites being mentioned, *Trypanosoma gambiense* and the three malaria plasmodia. The filtrable viruses are dismissed in four short paragraphs, and only a few of them are even mentioned. This portion of the work is very incomplete, contains very little data of real value to the medical student or practitioner because of its incompleteness, and is in sharp contrast to the remainder of the work, which is a real contribution to medical literature.

The book is well printed upon excellent paper and contains very few typographical errors.

CHAS. F. CRAIG.

A PRACTICAL TREATISE ON DISEASES OF THE SKIN, by Oliver S. Ormsby, M. D. Second Edition. Illustrated with 445 engravings and 4 plates in color and monochrome. Philadelphia and New York: Lea and Febiger. Price, \$10.

In this, the second edition of his work upon the diseases of the skin, the author has rewritten over four hundred pages of the text, described fifteen new diseases and brought the entire work fully up to date. The work, as it now stands, is one of the most valuable in the English language and well merits the cordial reception that was given the first edition.

Beginning with a well-written and most comprehensive section upon the anatomy and physiology of the skin, the author considers in turn the subjects of general etiology, pathology, diagnosis, prognosis and treatment, after which he describes in detail the various affections comprised in the following classes of diseases of the skin: hyperemias

and inflammations, hemorrhages, hypertrophies, atrophies, pigment anomalies, new growths, neuroses, parasitic infections, and diseases of the appendages.

The descriptions of the various diseases are clear and written in a pleasing manner while the directions regarding treatment are comprehensive and most valuable, especially to the general practitioner, who is often called upon to treat skin lesions and does not always have at hand the advice of a consulting specialist. It is noted that the chapter upon parasitic diseases of the skin covers more than one hundred pages and is very complete, even in the description of the rare forms of these infections occurring in the tropics. It appears to the reviewer that in this chapter there should be included tuberculosis, leprosy, oriental sore, syphilis and frambœsia, subjects which are now included in the chapter upon new growths. Surely these infections are parasitic in nature and, from the standpoint of etiology, should be placed in the chapter treating of parasitic infections.

The work is profusely illustrated and the illustrations are most excellent. It is believed that it will prove of great value to students and practitioners, and it can be recommended to them as a comprehensive, well-written, well-illustrated and authoritative work upon diseases of the skin.

CHAS. F. CRAIG.

OPERATIVE SURGERY, for Students and Practitioners, by John J. McGrath, M.D., F.A.C.S., Professor of Surgery, Fordham University; Consulting Surgeon to the People's Hospital; Visiting Surgeon to the Fordham, Columbus and New York Foundling Hospitals; Fellow of the American College of Surgeons; Fellow of the New York Academy of Medicine; Member of the American Medical Association. Sixth edition, revised, with 369 illustrations, including full-page color and half-tone. Philadelphia: F. A. Davis Company, 1921. Price, \$8 net.

Any book treating of operative surgery which has reached the sixth edition certainly has won the recognition of the profession as worth while. This book is divided into ten parts, with an index. Part one, General Considerations, discusses the subject of anesthetics, incisions, divisions of bone, hemorrhage—its means of arrest and treatment; the most applicable sutures for the different tissues of the anatomy, as skin, muscles, nerves, bone, serous surfaces, etc. Each of the remaining parts is begun by a description of its surgical anatomy and the operative treatment of its most frequent injuries and diseases, viz., those of the head and face; neck and tongue; thorax; abdomen and back; rectum; hernia, spermatic cord, testes, etc.; urinary system; upper extremities; lower extremities. This is an excellent manual; the anatomical descriptions are accurate and sufficiently detailed so that the operative technique is coordinated and readily followed. It is a most useful book to refresh the student's mind of his anatomy, so that he may understand the technique of the operation. To the surgeon, even of experience, it is of value in that it will renew his confidence in himself in the carrying out of his operative procedure. A book on operative surgery intended for students and practitioners, to be a most valuable text should not only, in the opinion of the writer, describe the operative procedure or procedures, but likewise give the indications, and as emphatically the contraindications, for any operative work. It should also, when the special preparation of the patient is vital to a successful postoperative outcome, call particular attention to this fact and tell what this special preparation is. As an example: In this book, in discussing the prostate, the author describes the operations of prostatectomy, which he says are operations for the extirpation of the prostate gland, for the purpose of relieving the obstruction offered by the hypertrophied gland to the proper evacuation

of the bladder. He then describes the different methods of operation without hinting at the vital necessity, in every such instance, of a determination of the kidney function and the percentage of blood urea before attempting the removal of the prostate. When these examinations are not satisfactory, a good way of bringing it about should be described and, when satisfactory, the operation may then be performed and not until then. All of this could be told in a few lines and might at worst only necessitate the elimination of some superfluous illustration or the description of some discarded operation. Instead of describing several obsolete operations for the transfusion of blood, the operations proven most applicable in practice might be given, and in warning against hemolysis a reliable method of selecting a donor explained. All this may more justly be expected to belong to the province of a useful text-book on surgery. Such a text-book should, however, neither specialize in anatomy nor in a too varied technique. A happy medium, as indicated by the examples of the prostate and the transfusion of blood, would be desirable in a most useful text-book on operative surgery. There is none such by an American author. The illustrations in this book are sufficiently numerous and good, but in some instances rather too schematic.

JOHN E. SUMMERS, M.D.

THE SURGICAL CLINICS OF NORTH AMERICA, issued serially every other month (six numbers per volume). Octavo; illustrated. Volume I, Number 3, Boston number. Philadelphia and London: W. B. Saunders Company. Cloth, \$16 per volume.

This is an instructive number and will compare favorably with the two preceding ones, those of Philadelphia and New York. There are twenty-one contributors. Several of the clinics strike the writer as of rather more than ordinary value; the first of these, that by Dr. Lahey on Osteomyelitis and Goitre (Hyperthyroidism), is given in illustration of the method of conducting a fourth-year students' surgical clinic for Tufts Medical School, at the Boston City Hospital. This method of conducting a clinic can be studied with advantage by any teacher of surgery; not only is it a good one for the student but it is carried out in a most excellent way for the benefit of the patient, which in reality should be the chief object. From the orthopedic Department of the Massachusetts General Hospital a number of interesting cases, with well-illustrated reports, are presented; this departmental clinic is rather an extensive one for the type of book, but as seven subjects are discussed the space occupied is probably necessary. Dr. Frederick J. Cotton has a reconstruction clinic chiefly devoted to the treatment of unfavorable results in bone and joint injuries.

JOHN E. SUMMERS, M.D.

INFECTIONS OF THE HAND, by Allen B. Kanavel, M.D., Assistant Professor of Surgery, Northwestern University Medical School; Attending Surgeon, Wesley and Cook County Hospitals, Chicago. Fourth edition, thoroughly revised. Illustrated, with 185 engravings. Philadelphia and New York: Lea & Febiger, 1921. Price, \$3.50.

This revised edition of Kanavel's classical work on Infections of the Hand is without question the most valuable contribution toward the surgical treatment of the acute and chronic suppurative processes of the fingers, hand, and forearm, that has appeared in print. It is a notable fact that in practically all of the recent American works upon surgery in which infections of the hand are discussed, Kanavel's

opinions are given prominent acceptance. One of the best things about this book is that the author tells the reader how best to get the most information out of it. He advises that the chapters on Diagnosis and Treatment in General be first carefully studied, so as to as nearly as possible place the case under consideration in its particular group, and then to study carefully that part of the book which treats of this type and location of infection. Every surgeon of years of experience must look back with regret upon a certain number of bad results of infections of the hand, and cannot but recognize that had he had the knowledge of the last few years, particularly that which has been contributed by Kanavel, some of these bad results would not have occurred, and none of them would have been as bad as they were. In this connection, the new chapter upon the Restoration of Function which has been added in this edition materially increases its value. The writer can hardly accept the rather veiled, pessimistic opinions of Doctor Kanavel relative to the serum and vaccine treatment of the systemic infections secondary to infections of the hand. He is, on the other hand, from personal knowledge, more inclined to accept the opinion of Kolmer (Keen's Surgery, Vol. 8, recently reviewed in these columns), who, in speaking particularly of streptococic infections, believes that the serum treatment possesses some value and is deserving of continued trial. He believes that if streptococci are ever successfully grouped, as are pneumococci and meningococci, better results will probably follow the use of monovalent sera. With our present knowledge of sera that antistreptococcus serum should be *highly polyvalent, given in large doses by intravenous injection and as soon as possible, from 50 to 100 c.c. should be given, and repeated in twelve hours if necessary; that is, if improvement does not occur after the initial reaction from the injection.* A study of this whole chapter by Kolmer is more than worth while for bedside practice.

JOHN E. SUMMERS, M.D.

OPERATIVE SURGERY, by John Fairbairn Binnie, A.M., C.M. (Aberdeen); F.A.C.S., Surgeon to the Christian Church, the Research and the General Hospitals, Kansas City, Mo.; Fellow of the American Surgical Association; Membre de Societe Internationale de Chirurgie; Member of the Western Surgical Association. Eighth edition, revised and enlarged, with 1,628 illustrations, a number of which are printed in colors. Cloth, 8vo. Price, \$12 net. Philadelphia: P. Blakiston's Sons & Co., 1921.

It must be the exceptional man who makes any pretense to do modern general surgery who is not an owner of "Binnie's Surgery." This is so because of the fact that there are few operations in surgery excepting those done for pathology peculiar to women that cannot be found well and briefly described in this book, and an authoritative statement of their value given so as not to be misunderstood. There is probably for this reason no single volume work upon operative surgery which is so authoritative and comforting to consult. Doctor Binnie has a happy way of speech and pen in expressing himself; he comes to the point without circumlocution. The eighth and last edition of his work is even better than any of its predecessors. That which is known to be good, although perhaps not young, has been retained; that which is up to date and of good promise is incorporated, as evidenced in the chapters upon Thoracic, Abdominal and Plastic Surgery, much knowledge of which was obtained by a wise interpretation of the experiences of the World War. Not only is "Binnie's Surgery," because of its worth, popular in this country, but the coming out of a new edition is anticipated with interest wherever the English language is understood.

JOHN E. SUMMERS, M.D.

ESSAYS ON SURGICAL SUBJECTS, by Sir Berkeley Moynihan, K.C.M.G., C.B., Leeds, England. Illustrated. Philadelphia and London: W. B. Saunders Company, 1921. Cloth, \$5 net.

These essays, which are dedicated to the Doctors Mayo, of Rochester, Minn., have all been published before and have appeared in American and English medical journals. The first, *The Murphy Memorial Oration*, was delivered before the American College of Surgeons at its Montreal meeting, October, 1920, and those who were fortunate enough to be present enjoyed a rare treat. Not only is Sir Berkeley one of the clearest of all those writing upon medical and surgical subjects today, but he has a personality and delivery which hold and charm his audience. The succeeding essays, *The Ritual of a Surgical Operation*, *The Diagnosis and Treatment of Chronic Gastric Ulcer*, *Disappointments after Gastroenterostomy*, *Intestinal Stasis*, *Acute Emergencies of Abdominal Disease*, *The Gifts of Surgery to Medicine*, *The Surgery of the Chest in Relation to Retained Projectiles*, *The Most Gentle Profession*, are all based upon the knowledge and experience of a remarkable man whose gifts of observation, and originality of thought and action, all bounded within the limits of common sense, have done much to round the corners of many others less cultured in the finer elements that tend to elevate our profession. *The Ritual of a Surgical Operation* can be read and reread by the young surgeon with great profit; it can be pondered over by an older surgeon. "He must set endeavor in continual motion and seek always and earnestly for simpler methods and a better way. In the craft of surgery the master word is simplicity." The essays treating of Gastric Ulcer and Gastroenterostomy are most valuable and are representative of the best knowledge we have upon these subjects. The writer does not believe, however, that the opinion and practice of Sir Berkeley to abandon gastroenterostomy with or without excision of the chronic ulcer in favor of partial gastrectomy, "whenever it can with reasonable safety be performed," is good advice. Moynihan's mortality rate, 2.5 per cent over a period of ten years, justifies his practice; likewise does that of some other English surgeons, notably Mr. Sherren, justify theirs. For the average surgeon the difficulties of the technique would unquestionably greatly increase the mortality over that of gastroenterostomy; the judgment of this type of surgeon might not be quite up to par as expected in the Moynihan opinion.

Those who have had the opportunity of watching and listening to Sir Berkeley in his operating room and wards at Leeds have recognized the master surgeon, technician and teacher. These essays are full of the knowledge of a great teacher who as a clear, instructive writer upon surgical subjects hardly has a peer among the "makers of books" in our times.

JOHN E. SUMMERS, M.D.

THE PRACTICE OF UROLOGY, A Surgical Treatise on Genito-urinary Diseases, including Syphilis, by Charles H. Chetwood, M.D., LL.D., F.A.C.S., Former Professor of Genito-Urinary Surgery, N. Y. Polyclinic; Visiting Surgeon to Bellevue Hospital; Consulting Urologist, French Hospital; Special Consulting Surgeon to Knickerbocker Hospital, St. John's Hospital (L. I. City); Nassau Hospital (Mineola), St. Agnes and White Plains Hospital; Member American Association of Genito-Urinary Surgery, American Urological Association; L'Association Internationale D'Urologie, etc. Third edition, profusely illustrated. New York: William Wood & Co. Price, \$8.

The author, in this newly revised edition, has adhered to the principle laid down in the first edition of this book, namely, that of being conservative in his recommendations in regard to new procedures, yet not disregarding nor condemning new teachings because they are new. It is sometimes very difficult for doctors, especially

opinions are given prominent acceptance. One of the best things about this book is that the author tells the reader how best to get the most information out of it. He advises that the chapters on Diagnosis and Treatment be first carefully studied, so as to as nearly as possible place the case under consideration in its particular group, and then to study carefully that part of the book which treats of this type and location of infection. Every surgeon of years of experience must look back with regret upon a certain number of bad results of infections on his hand, and cannot but recognize that had he had the knowledge of the last few years, particularly that which has been contributed by Kanavel, some of these bad results would not have occurred, and none of them would have been as bad as they were. In this connection, the new chapter upon the Restoration of Function which has been added in this edition materially increases its value. The writer can hardly accept the rather veiled, pessimistic opinions of Doctor Kanavel relative to the serum and vaccine treatment of the systemic infections secondary to infections of the head. He is, on the other hand, from personal knowledge, more inclined to accept the opinion of Kolmer (Keen's Surgery, Vol. 8, recently reviewed in these columns), who, in speaking particularly of streptococcic infections, believes that the serum treatment possesses some value and is deserving of continued trial. He believes that if streptococci are ever successfully grouped, as are pneumococci and meningococci, better results will probably follow the use of monovalent sera. With our present knowledge of sera that antistreptococcus serum should be *highly polyvalent, given in large doses by intravenous injection and as soon as possible*, from 50 to 100 cc. should be given, and repeated in twelve hours if necessary; that is, if improvement does not occur after the initial reaction from the injection. A study of this valuable chapter by Kolmer is more than worth while for bedside practice.

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among the younger members, to appraise at its real worth new procedures often recommended in terms of exaggerated praise and unbounded enthusiasm, only to find later that the "discoveries" have been put in the discard.

To help the doctor form a judgment by giving him the benefit of his extensive experience is one of the author's purposes in this book. Although the surgical side of genito-urinary diseases has been emphasized, about one hundred and eighty pages are devoted to a description of the venereal diseases and their complications.

There are many excellent full-page illustrations that add to the value of the book. It can be recommended to those interested in this specialty as a book of real value.

L. A. NEWFIELD, M.D.

THE SPLEEN AND SOME OF ITS DISEASES, by Sir Berkeley Moynihan, of Leeds, England. 129 pages, with 13 full-page diagrams. Philadelphia and London: W. B. Saunders Company, 1921. Cloth, \$5 net.

This monograph enters a new field of medical research hitherto vaguely touched upon by writers on medicine. It is comparatively within recent time that surgeons have undertaken to operate for diseases of the spleen. The author here goes into a full description of the diseases, the etiology of which may be laid to a disturbance of functions of the spleen. Splenomegaly has been taught to be the chief manifestation of splenic disease. However, it is being recognized today that in the causation of diseases and morbid processes there is a close interrelation between the various organs, an upset in the function of any particular one having an important and decided bearing on the etiology of the disease. The book points out the close relationship between the spleen and the other organs involved in diseases. The diseases described that offset the spleen are pernicious anemia, leukemia, Hodgkin's disease, splenic anemia (Banti's disease), hemolytic jaundice, Gaucher's disease, Von Jakseh's disease, and polycythemia. The author concludes that the diseases of the spleen are not isolated entities but rather local manifestations of systemic disorders.

There are full-page original diagrams that clearly demonstrate the diseases described. The author summarizes the present-day knowledge of the diseases of the spleen and has made a worthy contribution to medical literature.

L. A. NEWFIELD, M.D.

A TEXT-BOOK OF THE PRACTICE OF MEDICINE, by James M. Anders, M.D., Ph.D., LL.D., Professor of Medicine Graduate School of Medicine, University of Pennsylvania, Fourteenth edition, thoroughly revised with the assistance of John H. Musser, Jr., M.D., Associate in Medicine, University of Pennsylvania. Octavo of 1,284 pages, fully illustrated. Philadelphia and London: W. B. Saunders Company, 1920. Cloth, \$10 net.

The present edition has been revised to include amplifications of the following subjects: Typhus Fever, Yellow Fever, Cerebrospinal Meningitis, Pneumonia, Ictero-hemorrhagic Spirochetosis, Diabetes Mellitus, Scurvy, Pellagra, Pernicious Anemia, Exophthalmic Goitre, Focal Infection, Hemolytic Anemia of Pregnancy and the Puerperium, Asthma and Hay Fever. The section on influenza has been rewritten to include the results of a study of the recent pandemic.

For over a decade this book on the practice of medicine has been before the medical profession and has now reached the fourteenth edition. The place of merit attained by this work has been maintained by this edition. Those who are familiar with this book will here find an up-to-date practice of medicine; others will do well to have a copy of the book, which has taken its place as one of the foremost books on the practice of medicine.

L. A. NEWFIELD, M.D.

Obituary

BRIGADIER GENERAL ALFRED A. WOODHULL (1837-1921)

Through the death of General Alfred Alexander Woodhull at his home at Princeton, N. J., on October 19, 1921, the Medical Corps of the Army loses one of its oldest and most distinguished officers, a man who did much in the earlier days for the teaching of personal hygiene in the Army and the advancement of the general status of his Corps.

General Woodhull was born at Princeton on April 13, 1837, and was within six months of his eighty-fifth year at the time of his death. He was the son of Dr. Alfred A. Woodhull, of an old Princeton family, and of Anna Maria Salomons Woodhull, his wife. Receiving his bachelor's degree from Princeton University (then the College of New Jersey) in 1856, he acquired his Master's degree in 1859, and in the same year was graduated M.D. at the University of Pennsylvania. In 1894, he received the honorary degree of Doctor of Laws from his original alma mater. Of ardent disposition, he assisted in raising a company of volunteer mounted rifles at the outbreak of the Civil War, but his command not being mustered in, he took the examination for the Medical Corps, receiving his commission on September 19, 1861. He served through the entire war with credit, his major detail being that of medical inspector of the Army of the James (1864-65); he was breveted lieutenant colonel "for faithful and meritorious service" in March, 1865. At the conclusion of the war he was assigned to the Army Medical Museum, where he made one of the brilliant group which included Woodward, Otis, Billings and Edward Curtis, and where he prepared the Surgical Catalogue of the Museum Collections (1867) which is virtually an important supplementary volume of the Medical and Surgical History of the War. Passing through the successive grades of captain (1866), major (1876), lieutenant colonel (1894), and colonel (1900), he was chief surgeon of the then Department of the Pacific (Philippines) in 1899, and was retired from active service on April 13, 1901. By the Act of April 23, 1904, he was advanced to the rank of brigadier general (retired). On December 15, 1869, he married Miss Margaret Ellicott, of Baltimore, who survives him.

For nigh fifty years of his life, General Woodhull was a prominent contributor to medical literature, and very active in various patriotic societies and public services. He was gold medalist of the Military Service Institution in 1885 and Seaman prize essayist in 1907. In 1876 he published "Studies, Chiefly Clinical, on the Non-Emetic Use

of the Ipecacuanha," which is a memorial of the fact that he introduced into American practice the Anglo-Indian method of giving massive doses of this drug in dysentery, a practice now corroborated by Vedder's demonstration of the amœbicidal action of emetine (1910). In 1893 Woodhull was sent to England to study the Medical Department of the British Army, on which he rendered a valuable report in 1894. When the Surgeon General inquired if he would undertake this detail, Woodhull telegraphed back from his post in the West: "Will a fish swim?" His "Notes on Military Hygiene" for the use of the officers of the line (1896) passed through four editions (1898-1909). In 1906 he published a manual of personal hygiene for the use of undergraduates. He was lecturer on personal hygiene and general sanitation at Princeton University during 1902-7. Among his most original contributions are his report on the sanitary relations of military sites, published as a Senate Document (1894) and a remarkable study of "The Battle of Princeton" (1913), written from the tactical viewpoint.

General Woodhull was handsome, dark, of medium stature, a man of essentially kind disposition, set off by a strong sense of personal dignity. His feeling for the military scheme of things was of an exalted kind, his mind was of the intensive type, aggressive and courageous in the expression of opinion, with an extraordinary passion for accuracy in the minutest detail; and this, in connection with the austerities of the military *tenue* which were the fashion in his period, made him occasionally misprized and misunderstood; but to those who knew him better he was a good example of the "complete gentleman" of the Nichomachean Ethics. His letter to Billings on the completion of the New York Public Library, written at the age of 74, is a measure of the depth and degree of his friendship. For those who had occasion to work with him on military or genealogical data, he was a formidable master of the intricacies of exact documentation. His memory for the events, dates and participants of the Civil War period was little short of marvelous, but no detail was allowed to pass without actual verification from the records. His interest in the Army was lifelong, and it is plain that his early upbringing was of the Roman order, "to be manly, silent, modest, obedient and devoted to the state and the gods."

F. H. GARRISON.

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